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THE WORLD

BY

J. MURRAY, M.A., Ph.D.

RECTOR OF ANNAN ACADEMY



LONDON

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1929

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PREFACE

THE present volume forms one of the Intermediate Series of textbooks designed to meet the needs of pupils in Central Schools and the upper classes of Elementary Schools, and also of those in the lower forms of Secondary Schools. It is specially adapted for the Qualifying Classes of Scottish Primary Schools, and also for the Advanced Division Classes. Teachers will find that *The World* fits into a scheme of work for three or four years, covering the ages 11-12 to 15. It supplies a general survey wherein the continents are given adequate treatment on a relative basis. In accordance with the plan underlying the Intermediate Series, the British Isles and the British Empire are left for special treatment in separate volumes.

The book in its presentation of the geography of the World follows a uniform plan which the writer has found to work admirably in practice. Relief and Climate are recognised as the twin supports of geography, and the whole structure has been built up on these. The Exercises form an integral part of the plan. It will be noted that they adopt the same general order as is pursued in the text. Hence they ought to be carefully worked out. At all points constant use of the Atlas is necessary.

Many of the maps have been specially drawn for the

book, and for the others the Author is deeply indebted to the writers of *The Explorer Geographies*, issued by Messrs G. Bell & Sons. To Mr W. Anderson, M.A., of the Staff of Annan Academy, who read the proofs, to Dr Wilmore, the Editor of the Series, and to Mr A. N. Wilmore for reading the final proofs and compiling the Index, the writer wishes to record his obligations.

J. M.

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U. S. Geographical

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THE WORLD

CHAPTER I

EUROPE

1. General.—The world is divided into two hemispheres—the eastern half of the globe being known as the Old World, the western half as the New World. Within the former are included four of the continents, namely, Europe, Asia, Africa, and Australia, while the latter includes North America and South America. You will observe that three out of the four continents in the Old World form one great land-mass, and that the fourth is the island continent of Australia. It will be clear to you that Africa, since it is linked to Asia by a very narrow isthmus, may be considered separately, but Europe and Asia are really one. Hence we have in geography the name Eurasia. Out of a total land-surface of 36,000,000 square miles in the Old World, Eurasia occupies nearly 21,000,000. This will give you some idea of its great size.

In Eurasia there is a great difference between East and West. On the one hand we have China, Japan, and India—the fabled East, and on the other we have Great Britain, France, Spain, Germany, and Italy—the western world of history. Lying between these are the lands of the Near East such as Persia, Asia Minor, Arabia, and Syria,

EUROPE

and the great interior mass of steppes and semi-deserts known as the Heartland of the Old World—Southern Russia and Siberia and Turkestan. Again, Asia's outlook is to the Pacific and Indian Oceans, Europe's to the



FIG. 1A.—Western Hemisphere.

Atlantic Ocean and the Mediterranean Sea. On the north both continents rise from the Arctic Ocean.

2. Relief.—We may use the word relief to denote the general build of any land-mass. Within Eurasia four

main relief divisions can be traced. Look carefully at your map for these.

(1) To the north-west in Europe and to the north-east in Asia lie plateaux consisting of very ancient rocks.



FIG. 1B.—Eastern Hemisphere.

These include the worn-down mountains of Scandinavia and of Scotland and the Yablonoi and Stanovoi Ranges.

(2) Southwards of the plateaux and between them stretch the Northern Lowlands from the plains of Flanders to the mouth of the Lena.

EUROPE

(3) Then come the mid-old world mountains, girdling Eurasia from the Pyrenees to the far south-east of China.

(4) Jutting southwards into the Mediterranean Sea and the Indian Ocean are the southern peninsulas—the Iberian (Spain and Portugal), Italian, Balkan, Arabian, Indian, and Malayan.

Europe is, in fact, a western offshoot or extension of Asia, just a great peninsula of the main land-mass. This is true not only of relief but of climate, plants, and animals. It is nevertheless also true that Europe ranks as the more important of the two continents, though it is only one-fifth the size of Asia, and though a definite boundary is very difficult to trace.

Let us now look more especially at the relief of Europe as a distinct and separate continent. In studying this we may try four different methods. They will all help us to get a better idea of Europe's build. Once again be sure to look up every place mentioned.

Firstly, if the contour line of 1200 feet be taken as a line of separation, there are then three physical units: (a) the North-west Highlands, including most of the area to the north-west of a line from Bristol to Tornea; (b) the Central Lowlands, consisting of a funnel-shaped area between Baku and Kara Bay at its widest limits and between Nantes and Bristol at its narrowest; (c) the Southern Mountains, including most of Europe south of the 50° line of latitude. Secondly, if a line be drawn from Nordkyn to Galatz, all to the east of this line is more or less lowland, while most of the mountainous portions of Europe lie to the west of it. Then, thirdly, if an irregular four-sided figure be formed by linking up Odessa, Danzig,

Brest, and Bayonne, this encloses what has been called the primary peninsula of Europe. To the north and south of the block lie the secondary peninsulas—Scandinavia, Denmark, the British Isles Platform, Spain, Italy, and the Balkan Peninsula. And, fourthly, if we are thinking more of structure and origin than of mere height, five sub-divisions may be traced—(1) the North-west Highlands, as already mentioned; (2) the Central Lowlands, including both the Northland Seas and the Great European Plain; (3) the Central European Highlands; (4) the Southern Fold Mountains; and (5) the Mediterranean area, including, for instance, the ancient plateaux of the Meseta in Central Spain and the basins of the great sea itself and of the Black Sea.

We shall adopt this fourth method in our brief study of the relief of Europe.

(1) **The North-west Highlands.**—This section of the relief includes Finland, Lapland, Scandinavia (with the exception of Scania in the extreme south where the rocks are younger), Scotland north-west of a line from Stonehaven to Helensburgh, and Ireland north-west of a line from Ballymena to Galway. The whole region thus included is really the worn-down remnant of an ancient continent, so that the present mountains are mere stumps of what they originally must have been. You will note that the remnant is broken up by the intervening seas into three masses, but at one time they were all joined.

(2) **The Central Lowlands.**—In these there are two main divisions—the West Central Lowlands bounded by the meridians of 0° and 30° E., and the East Central Lowlands, occupying most of Russia. The former include South-eastern England, Northern France, the English

EUROPE

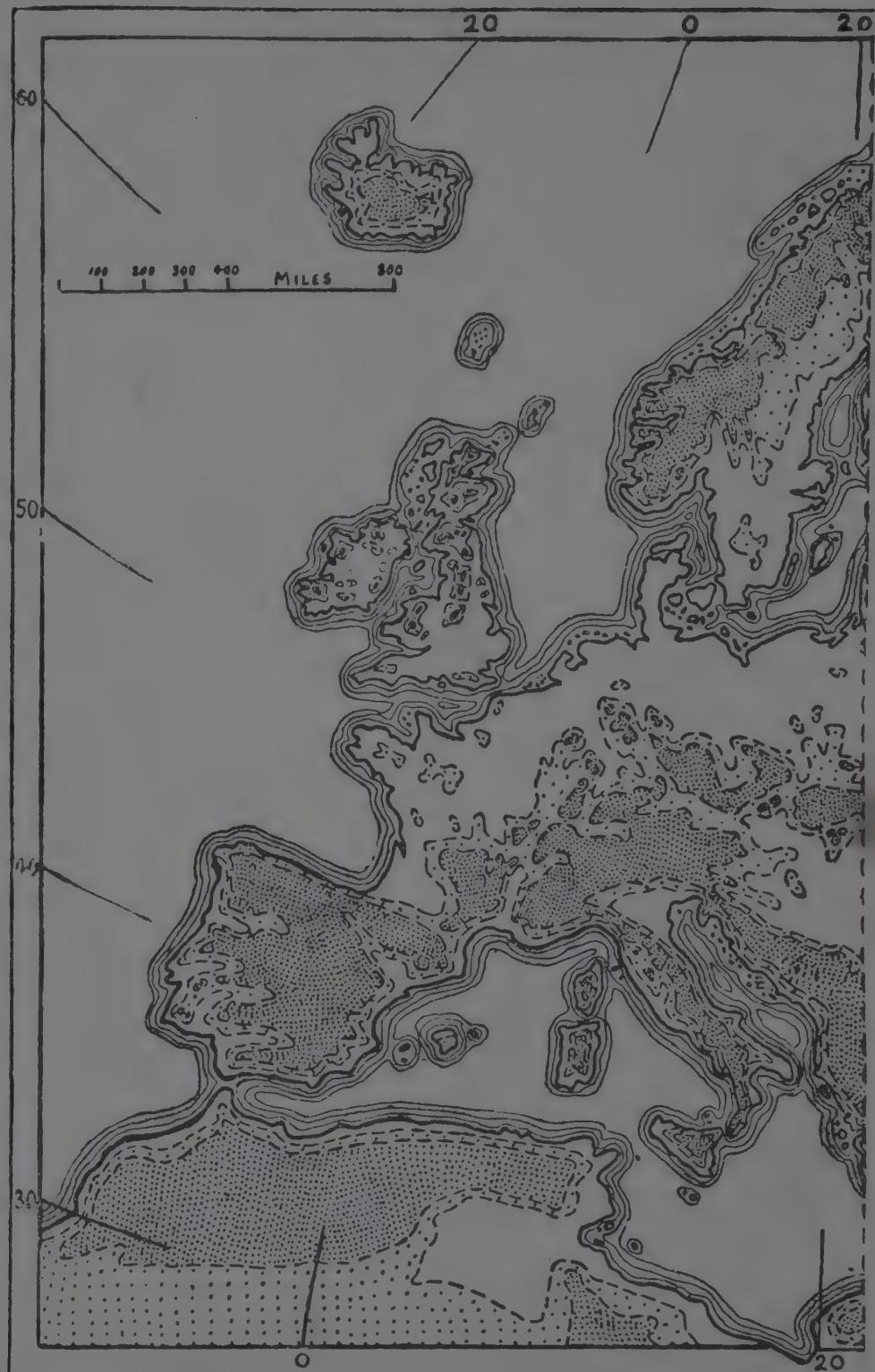
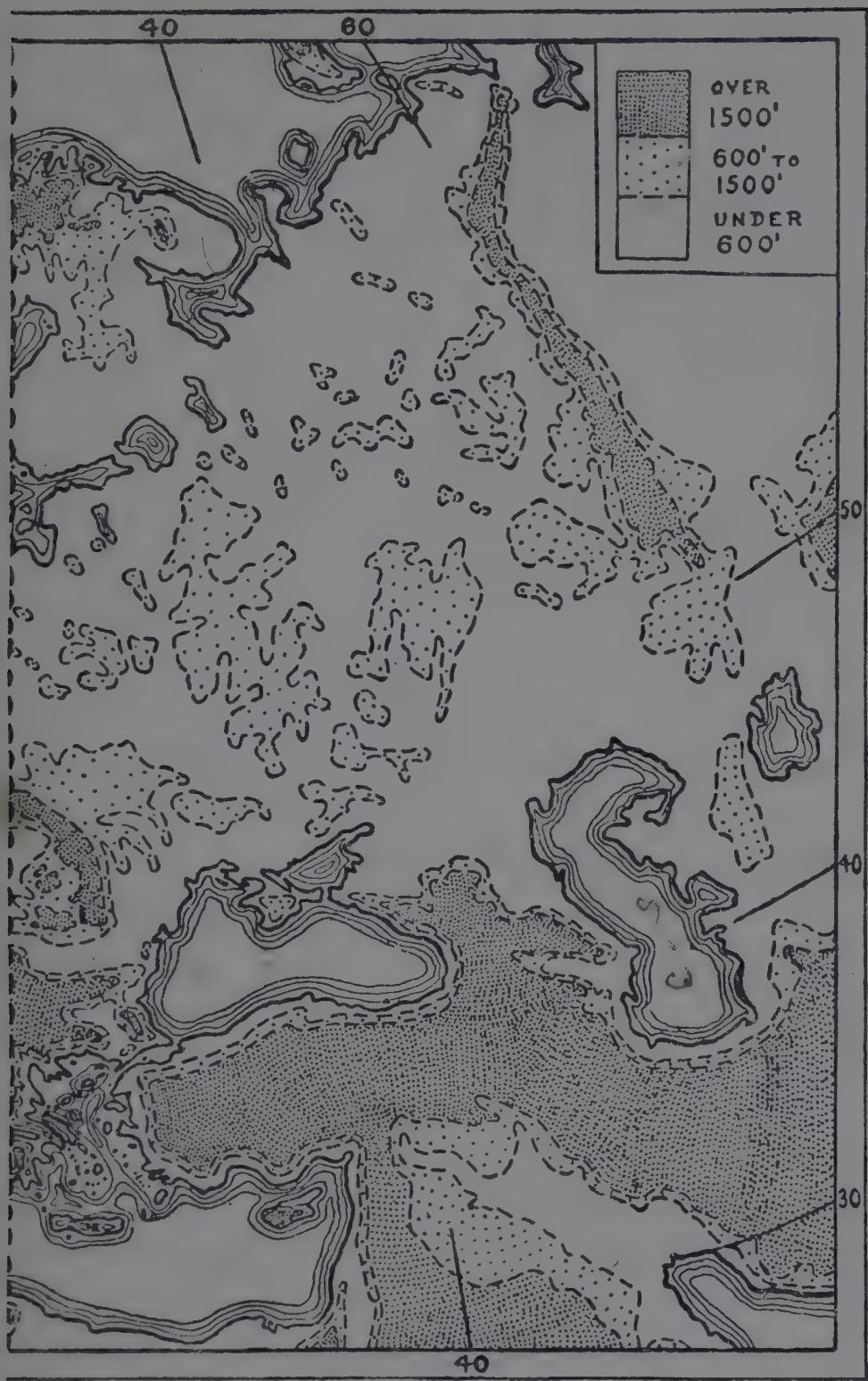


FIG. 2.—Generalised physical

EUROPE

7



Map of Europe.

Fenlands, the delta of the Rhine, the Low Countries, the dunes of the Dutch coast and of North-west Germany, the great moors of the Ems and the Lower Rhine, the Baltic Heights from Schleswig to the Gulf of Finland, and the depression between these heights and the Central Highlands. The North and Baltic Seas are portions of this great plain covered by shallow waters. The East Central Lowlands extend from the Arctic Ocean on the north to the Black and Caspian Seas on the south, and from the Baltic Heights and the Carpathians on the west to the Urals on the east. The Russian Plain is not, of course, absolutely flat. River courses and low hills diversify the surface. The greatest height is attained in the Valdai Hills (1100 feet).

(3) **The Central European Highlands.**—These stretch, though not in a continuous line, from South Ireland to Russia. Long ago there existed right across Europe a chain of mountains, of which the highlands of South Ireland and of South Wales, the Cornish and Devon heights, the uplands of Brittany and Normandy, and very probably the Central Plateau of France, are but disconnected remnants. These may be called the western fragments, but eastwards there is a second set. This includes—the Ardennes, the Hardt and Vosges Mountains, the Black Forest, the Bohemian Plateau, the Harz Mountains, the Weser Highlands, and the Thuringer Wald. From a physical map alone you might be tempted to include under the second group those hills which, to the north-west of the German portion of the Danube, go by the name of the Franconian and Swabian Jura. As a matter of fact they are younger hills and really belong to the Alpine system of mountains.

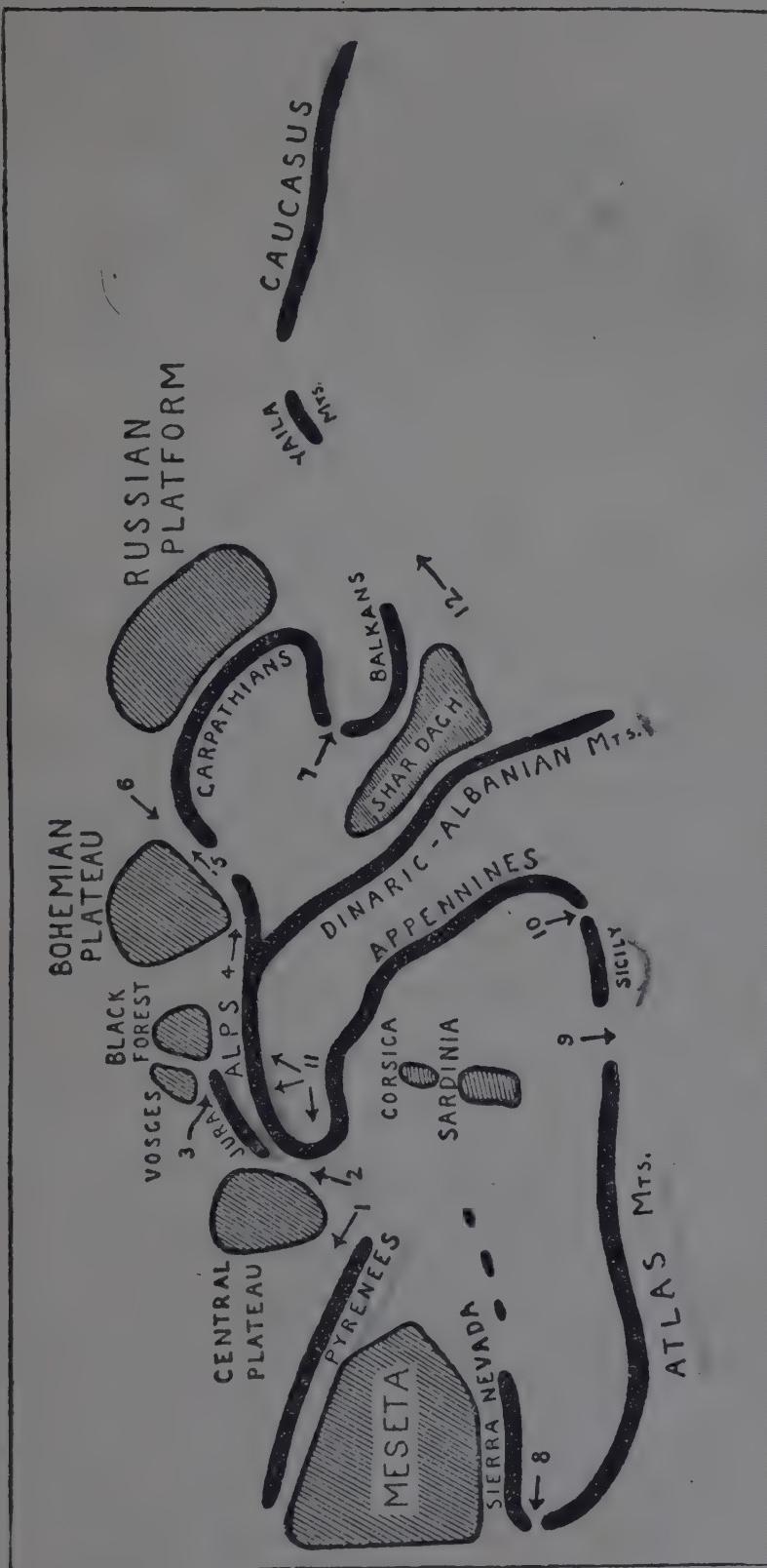


FIG. 3.—The Fold Mountains and Block Mountains of Southern Europe, showing:

1. Iron Gates.
2. Rhone Valley.
3. Gate of Belfort.
4. Austrian Gate.
5. Moravian Gate.
6. Silesian Gate.
7. Gate of Carcassonne.
8. Strait of Gibraltar.
9. Strait of Tunis.
10. Strait of Messina.
11. Alpine Passes.
12. Dardanelles and Bosphorus.

(4) **The Southern Fold Mountains.**—The great chains of these mountains are but the European section of the mid-world fold system. As the Alps form one of the best known mountain ranges of this section, the name Alpine system is often given to it. The main line runs through the Alps proper, the Carpathians, the Transylvanian Alps, the Balkans, the Yaila Mountains of the Crimea, and the Caucasus. From this mighty main line one secondary line loops in a great festoon round the basin of the Western Mediterranean. To the south-east run the Apennines which are continued through Sicily to the Atlas Mountains of North Africa. A sharp bend carries the trend to the Sierra Nevada of South Spain. Thereafter the course is through the Balearic Isles. Another secondary line runs by the Dinaric-Albanian Mountains to the east of the Adriatic Sea basin, and is continued through Crete and Cyprus to the Taurus Mountains of Asia Minor.

Now this great system is much younger than the Central Highlands. Indeed the direction of the trend of the main line and of the secondary loops is determined by the position of the separate portions of the Central Highlands. The latter acted as buttresses against which the folds were pressed. To the blocks already mentioned under (3) we should now add the plateau of the Meseta in Spain and the Shar Dagh knot of mountains in the heart of the Balkan Peninsula. Try this simple experiment for yourselves. Place a cover over a large table and on it arrange books or weights to represent the buttresses. You will find their positions on your physical map. Then push the cover with your hands towards the books or weights (*i.e.* from the south on the actual map), and

the folds of the cover will arrange themselves roughly as the folds of the mountain system. You should copy the sketch map and make yourselves thoroughly familiar with the names of the portions of the Alpine system and of the buttress-blocks.

Between the Central Highlands and the Fold Mountains convenient lowland passages occur. These are generally called "gates," and a knowledge of their position is of the greatest importance. The Gate of Carcassonne opens between the Pyrenees and the Central Plateau of France, the valley of the Rhone between the Western Alps and the Central Plateau, the Gate of Belfort between the Jura and the Vosges, the Austrian Gate between the Eastern Alps and the Bohemian Plateau, the Moravian Gate between the Little Carpathians and the Moravian heights, and the Silesian Gate between the Carpathians and the Sudetes.

(5) **The Mediterranean Area.**—In the Mediterranean Sea itself we must note two basins—western and eastern, for at one time the great sea was not a continuous sheet of water. The western basin is ringed by the loop of Fold Mountains mentioned under (4). Out of it lead many passages—the Strait of Gibraltar, the Ebro Valley, the Gate of Carcassonne, the Rhone Valley, some Alpine Passes, the Apennine Passes, the Straits of Messina and Tunis. The eastern basin extends from Malta to the coast of Syria. The portion of it between the coasts of Asia Minor and Egypt is known as the Levant. From this basin the outward passages are—the Straits of Messina and Otranto, the Plain of Lombardy and the Alpine Passes from the head of the long arm of the Adriatic Sea, the Dardanelles and Bosphorus conducting

to the Black Sea from the second northward arm of the Ægean, the Cilician Gates leading from the Levant to the Plateau of Asia Minor, and the Nile Valley.

Like its northern counterpart, the Baltic, the Mediterranean Sea is almost landlocked. Very little of the Atlantic tide enters it, and only slight tides are raised in the great inland sea itself.

3. Rivers.—We may treat the rivers of Europe from the point of view of drainage or of source. Under drainage there are clearly three main areas—Arctic Ocean, Atlantic Ocean, and Caspian Sea. Remember that the second will include the Baltic Sea, the North Sea, the English Channel, the Bay of Biscay, the Mediterranean Sea, and the Black Sea. From your map find the rivers entering the three catchment basins. Many are not of much account, but there are at least a dozen of importance—the Vistula, the Elbe, the Rhine, the Thames, the Seine, the Loire, the Garonne, the Tagus, the Rhone, the Po, the Danube, and the Volga. Next take the rivers of Europe from the source point of view and you will discover that there are again three main areas—Northwest Highlands, Central Highlands, and Fold Mountains. Find, as in the former case, the rivers of the three areas, and trace generally the watershed between the rivers which flow northwards and those which flow southwards.

Of the European rivers two are of great international importance—the Rhine and the Danube.

(a) **The Rhine.**—The Rhine, by two headstreams known as the Vorder and Hinter Rhein (*i.e.* the Further and Hither Rhine), rises in the Swiss Alps. After getting clear of the mountains, it passes northwards through Lake

Constance. Issuing from the lake its course is in general westwards as far as Basel. A great tributary, the Aar, joins the main river on this section. This stream, with its feeders, drains most of the Swiss lakes—Neuchâtel, Biègne, Brienz, Thun, Lucerne, and Zurich. Northwards from Basel to Mainz, the Rhine flows through a remarkable valley, the Rift Valley, bounded on the west by the Vosges and Hardt Mountains, and on the east by the Black Forest and the Odenwald. In this section of its course it receives on the right bank the Neckar and the Main, which rise in the German Juras. Between Mainz and Köln (Cologne), the Rhine and its feeders, the Lahn and the Moselle, on their way through the Rhenish Plateau, have deeply notched their courses into the surface, so that the whole plateau has become broken up into separate portions. Note these in your map—Taunus, Hunsrück, Westerwald, Sauerland, Eifel, Ardennes. The part of the main course between Bingen and Bonn is known as the Rhine Gorge. Beyond Köln (Cologne) the great river enters on the plain, and finally by a delta, which is practically Holland, enters the North Sea. Altogether the Rhine has a length of about 800 miles and is navigable as far as Strasbourg. Ocean steamers can reach Köln. The river is the most important waterway of Europe, and throughout history has formed, with the Rhone system, which comes very close to it at the Burgundian Gate or Belfort Gap, one of the main north-south trade corridors of the Continent.

(b) **The Danube.**—The Danube (about 1800 miles) is the longest river of peninsular Europe. As in the Rhine, two small headstreams, rising in the southern section of the Black Forest, unite to form the main river. As far as

Passau the course of the Danube lies within German territory. In this portion the great river receives, on the left bank, at least four feeders. Of these the Naab, from the Fichtel Gebirge, is the chief. On the right the Iller, the Lech, the Isar, and the Inn bring down waters from

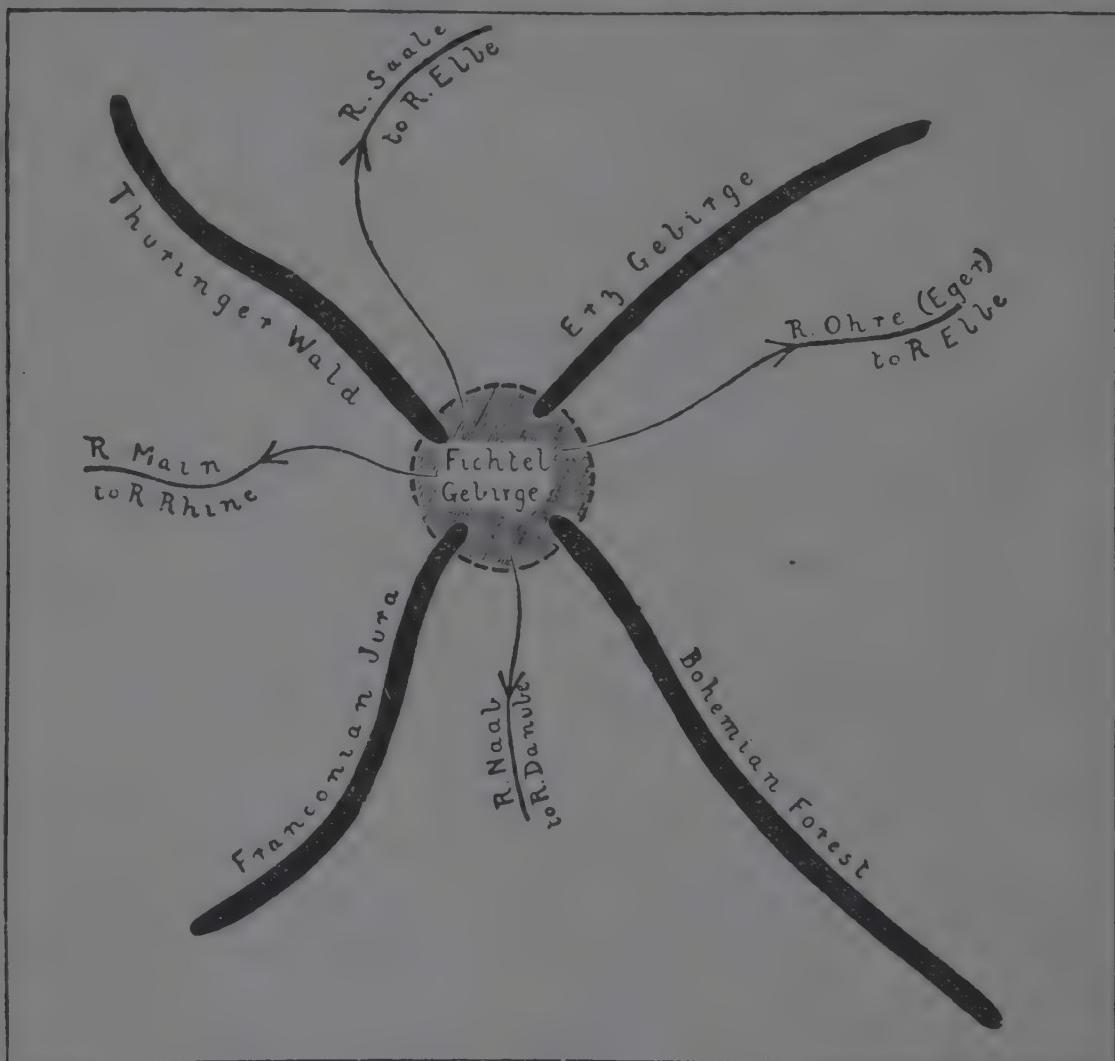


FIG. 4.—Fichtel Gebirge Centre.

the melting Alpine snows. From Passau, where the river enters Austrian territory, by Linz to Krems, the Danube flows through the Austrian Gate. Compare this with the Rhine Gorge from Bingen by Coblenz to Bonn. Near Linz the Enns joins on the right bank. Beyond the basin of Vienna the Danube breaks through the southern

end of the Little Carpathians by the Carpathian Gate. Within the basin, the March, rising in the Sudetic Mountains and offering a passage by the Moravian and Silesian Gates to the Upper Oder, joins on the left bank.

The next section of the Danube lies within Hungarian territory. The Plain of Hungary is divided into two by

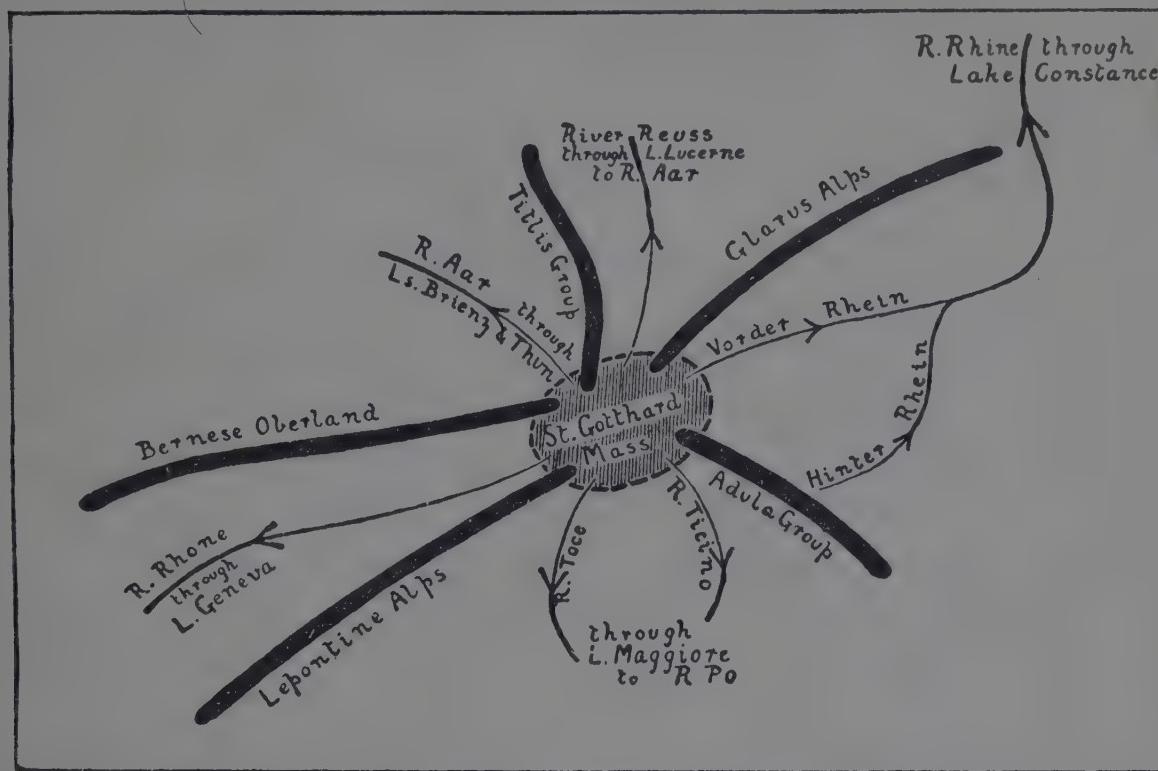


FIG. 5.—The Swiss Alps Centre.

the Bakony Wald. In the so-called Upper Hungarian Plain the Danube receives two tributaries—the Waag and the Raab. Northwards of Buda-Pest it forms the third passage in its course—the Hungarian Gate. For a considerable distance, to the confluence of the Drave from the Eastern Alps, the great river runs due south. Between that point and the Iron Gate, when the course is in general south-eastwards, the Danube receives on the left bank the Theiss, which rises in the Carpathians, and on the right the Save, which rises in the Julian Alps.

From the Iron Gate to the Black Sea is the fourth or Balkan section of the mighty stream. On both banks it receives feeders—their sources lie in the Transylvanian Alps and in the Balkan Mountains. After a great bend by Rustchuk and Silistria, the river turns abruptly eastwards at Galatz and enters the Black Sea by a delta.

Just as the Rhine is the north-south water highway of Europe so the Danube is the west-east, though the fact that it enters an almost enclosed sea lessens its value as a route. Both rivers are worth careful study. Indeed much of the geography of the primary peninsula of Europe may be learnt from such a study.

Certain mountain knots form distinct centres of river radiation. On pp. 14 and 15 are given two examples of what is meant by this statement. As the figures are self-evident no note is added, but you might write brief accounts for yourselves.

CHAPTER II

EUROPE: CLIMATE AND VEGETATION

4. Climate.—So far we have been considering the relief of Europe. That is really but one part of the story, for (in geography) we can never get far away from climate or the average weather conditions. In Great Britain we certainly recognise the truth of this statement, for our common greetings almost always refer to the weather. Weather conditions affect a great many different things—crops, food, clothing, type and shape of buildings, our work, and so on. It is necessary then that we should have a clear idea of the climate of the continent which we are studying. You will already know something about climate in general. Let us try to apply what you do know to Europe.

In the first place, just as a map study exercise, we may seek for some of the factors influencing Europe's climate. Look at Europe's position on the world map. It extends through 35° of latitude, from about 35° N. to 70° N. Its breadth (west-east) is greater than its length (north-south), and, since it narrows towards the north, only the northern portions of Scandinavia and Russia are within the Arctic Circle. This means that, though there must be some considerable difference in temperature between north and south, the bulk of the Continent is within the temperate zone. Further, you will remember that we insisted upon the fact that Europe is a westward peninsula of Asia. We should expect then that the climate of the greater

EUROPE



FIG. 6.

continent would influence that of its peninsula, especially in the east. Note, too, how the seas of Europe—Baltic, North, Mediterranean, Adriatic, Ægean, Black—penetrate far inland and so carry their influence into the interior. Still further, on the west lies the great Atlantic Ocean. We must remember that oceans make the temperature of places near them more equable, and that the winds which blow from them as a rule bring rain. Again, the main mountain barrier in Europe runs west-east, so as to cut off the south very effectively from the centre and north. But no great barrier lies on the west coast of Europe as on the west coast of America. When rain-bearing winds from the sea have to pass over mountains a great deal of rain falls, and on the farther or leeward side there is less rain and we have what is called a rain-shadow. In Europe the mountain ranges which run north-south to act as barriers to the influence of the ocean are neither very high nor very long. Their effect is thus lessened.

(1) **Temperature.**—On a temperature map lines called isotherms are shown. These are drawn through places of equal average temperature. It is usual to have two maps, one indicating the January isotherms, the other the July isotherms. Now, on the January map, as you will see, the general trend of the isotherms is not from west to east but from north-west to south-east. In fact on the west, towards the ocean, the lines run almost north-south. Why? We have already got the answer. In the west lies the Atlantic Ocean where the air temperature for this month is higher than it is for the air over the land. By the agency of the winds and of the warm Atlantic Drift¹ the

¹ This is the name given to the broad irregular drift of waters from the south-west. The Gulf Stream is but a part of it.

influence of the ocean is borne in on the land, so that, contrary to what we might expect, west becomes warmer than east instead of south being warmer than north. Note from the map that, as we go eastwards, the isotherms tend to swing from north-south to west-east. The reason for this will be, of course, clear to you—the east is getting away from oceanic influence, and that of latitude or distance from the Equator is now being felt. Carefully trace the trend of the 32° F. isotherm on the map. For January the coldest part of Europe is the extreme north-east of Russia where the average temperature falls below 0° F.; the warmest part is the extreme tips of the three southern peninsulas, which are over 50° F. The western regions near the ocean, from Bergen to the English Channel, are over 32° F., and from Cape Wrath to Cape Finisterre are over 40° F. The main bulk of the Continent eastwards of Bergen, Hamburg, Trieste, and Constantinople is under 32° F.

Turn now to the July map. For this month the trend of the isotherms is roughly west-east, clearly showing the effect of latitude. Only on the extreme west is there a tendency for the isotherms to bend southwards. Perhaps the most important isotherm is the 70° F. one. Trace its course on the map. Scarcely any part of Europe is under 50° F. In the three Mediterranean peninsulas we find areas with over 80° F.

The intersection of the 32° F. line for January and the 70° F. line for July gives the four temperature regions. These are:

(a) **Western.**—Where the temperature is over 32° F. in January and under 70° in July, *i.e.* mild in winter and cool in summer; typical places are Edinburgh 38° and 58° and Brussels 34° and 63° .



FIG. 7.

(b) **North-eastern.**—Where the temperature is under 32° in January and under 70° in July, *i.e.* cold in winter and cool in summer; typical places are Stockholm 26° and 62° , and Riga 23° and 64° .

(c) **South-eastern.**—Where the temperature is under 32° in January and over 70° in July, *i.e.* cold in winter and warm in summer; typical places are Odessa 25° and 73° , and Astrakhan 19° and 78° .

(d) **Southern.**—Where the temperature is over 32° in January and over 70° in July, *i.e.* mild in winter and warm in summer; typical places are Lisbon 49° and 70° , and Rome 44° and 77° .

Below you will find a very useful table. It gives, for the coldest and for the warmest month, the temperatures of places from west to east. The difference between the two temperatures is the range. Note how the range increases as we leave the equalising influence of the ocean. The places are near akin in latitude and altitude.

Place.	Coldest Month Temperature.	Warmest Month Temperature.	Range.
Valentia .	44° F.	59° F.	15° F.
Dublin .	42° F.	61° F.	19° F.
London .	39° F.	63° F.	24° F.
Paris .	36° F.	65° F.	29° F.
Berlin .	31° F.	65° F.	34° F.
Warsaw .	26° F.	66° F.	40° F.
Moscow .	12° F.	66° F.	54° F.

(2) **Winds and Rainfall.**—We shall not say much about the winds of Europe. These depend on air-



FIG. 8.

pressure, a subject which is somewhat beyond your stage. For the present let us assume two very important facts. These are: (1) the winds of Western Europe blow mostly from the west, both in summer and in winter; (2) in Eastern Europe the winds are from the east or south-east in winter and from the north or north-east in summer. The prevailing winds of Western Europe are thus, both summer and winter, coming off the Atlantic Ocean, and the winds of Eastern Europe are thus, both summer and winter, coming off the great land-mass of Asia.

The last sentence gives us the clue to the rainfall of Europe. On the west, where the moisture-bearing winds exert a great influence, there is rain all the year round, with the maximum in autumn and winter. The map shows that, just as we should expect, the mountainous regions, for example Norway, West Scotland, West Ireland, Wales, the Lake District, and North-west Spain, get the greatest amount. In Central and Eastern Europe, and especially as we get farther from the ocean, the rainfall is much less heavy and comes more in the form of summer thunder showers.

Below you will find a few figures to illustrate what we have been saying about rainfall. They should be very carefully noted, for they are of more value than general statements.

(a) The first set gives the mean annual rainfall for a few places. Note that the amount gets less from west to east.

(b) The second set gives statistics for a number of places along the west coast. The point to note here is that the difference between the wettest and the driest month is not great, in other words that the rainfall is evenly distributed throughout the year.

(a)

Place.	Mean Annual Rain-fall in Inches.											

Valentia	56
Brussels	30
Köln (Cologne)	25
Berlin	23
Warsaw	22
Moscow	21

(b)

Place.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Bergen .	6·9	5·6	4·3	3·8	4·1	4·4	5·9	6·9	8·3	8·8	6·7	7·4	73·1
Valentia .	5·6	4·9	4·1	3·9	3·1	3·5	3·7	5·1	4·6	5·5	5·5	6·5	56·0
Plymouth .	3·6	2·8	2·5	2·3	1·9	2·2	2·9	3·0	3·1	3·8	3·7	4·1	35·9
Brest .	3·3	3·0	2·2	2·1	1·9	2·0	2·1	2·1	3·1	3·6	3·8	3·2	32·4
Bordeaux .	2·8	2·3	2·5	2·6	2·9	3·2	2·0	2·2	2·6	3·7	3·7	2·9	33·4
Bayonne .	3·5	3·0	3·8	3·7	3·0	3·2	2·4	2·7	4·5	5·6	5·7	4·2	45·3
Hamburg .	1·9	1·7	2·0	1·7	2·2	3·1	3·4	3·0	2·6	2·6	2·3	2·4	28·9

(c) The third set gives the distribution for Central and Eastern Europe. Note how the heavier rainfall is distinctly in the summer months.

Place.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Cracow .	1·1	1·0	1·4	1·7	2·8	3·6	3·5	3·4	2·4	2·0	1·5	1·5	25·9
Leipzig .	1·3	1·3	1·9	1·6	2·0	3·0	3·1	2·6	1·8	2·0	1·9	1·8	24·3
Warsaw .	1·2	1·1	1·3	1·5	1·9	2·7	3·0	3·1	1·9	1·7	1·5	1·4	22·3
Kiev .	1·1	0·8	1·5	1·7	1·7	2·4	3·0	2·4	1·7	1·7	1·5	1·5	21·1
Moscow .	1·1	0·9	1·2	1·5	1·9	2·0	2·8	2·9	2·2	1·4	1·6	1·5	21·0
Odessa .	0·9	0·7	1·1	1·1	1·3	2·3	2·1	1·2	1·4	1·1	1·6	1·3	16·1

(d) The fourth set gives the Mediterranean distribution. Here we look for the heavier rainfall in the winter months.

Place.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Seville .	2·1	1·9	2·5	1·9	1·7	0·6	0·0	0·2	0·7	1·9	2·4	2·7	18·6
Gibraltar	4·3	3·5	4·4	2·8	1·7	0·4	0·0	0·1	1·2	3·3	4·5	6·1	32·3
Genoa .	4·2	4·3	4·1	4·1	3·4	2·7	1·6	2·4	5·0	7·8	7·4	4·8	51·8
Rome .	3·1	2·4	2·7	2·6	2·2	1·5	0·7	1·1	2·9	4·5	4·4	3·6	31·7
Athens .	2·0	1·5	1·3	0·8	0·8	0·7	0·3	0·4	0·6	1·7	2·9	2·4	15·4
Constanti- nople .	3·4	2·7	2·4	1·7	1·2	1·3	1·1	1·7	2·0	2·5	4·0	4·8	28·8

5. Natural Vegetation.—Under this general term come three main formations—grassland, woodland, and desert. Plant-life depends largely on climate, and rainfall is by far the most important factor.

(1) In the first place we have the cold desert of the north, which goes by the name of Tundra. This is met with in the northern margin of Russia. Here the climatic conditions are a short cool summer and a long severe winter. Such conditions are not of course favourable to the growth of vegetation. Plants are stunted and consist very largely of dwarf shrubs, mosses, and lichens.

(2) Southwards we pass through the coniferous forest belt of Scandinavia, Finland, and most of North Russia. The conifers—firs, pines, larches—with their needle-like leaves are specially adapted to withstand a harsh climate, more particularly the lack of rain and the heavy snowfall.

(3) The third belt is the western forest zone (or parklands), which covers most of the Atlantic seaboard and of West-central Europe. The climatic factors are, as you now know, an equable temperature and rain at all seasons.

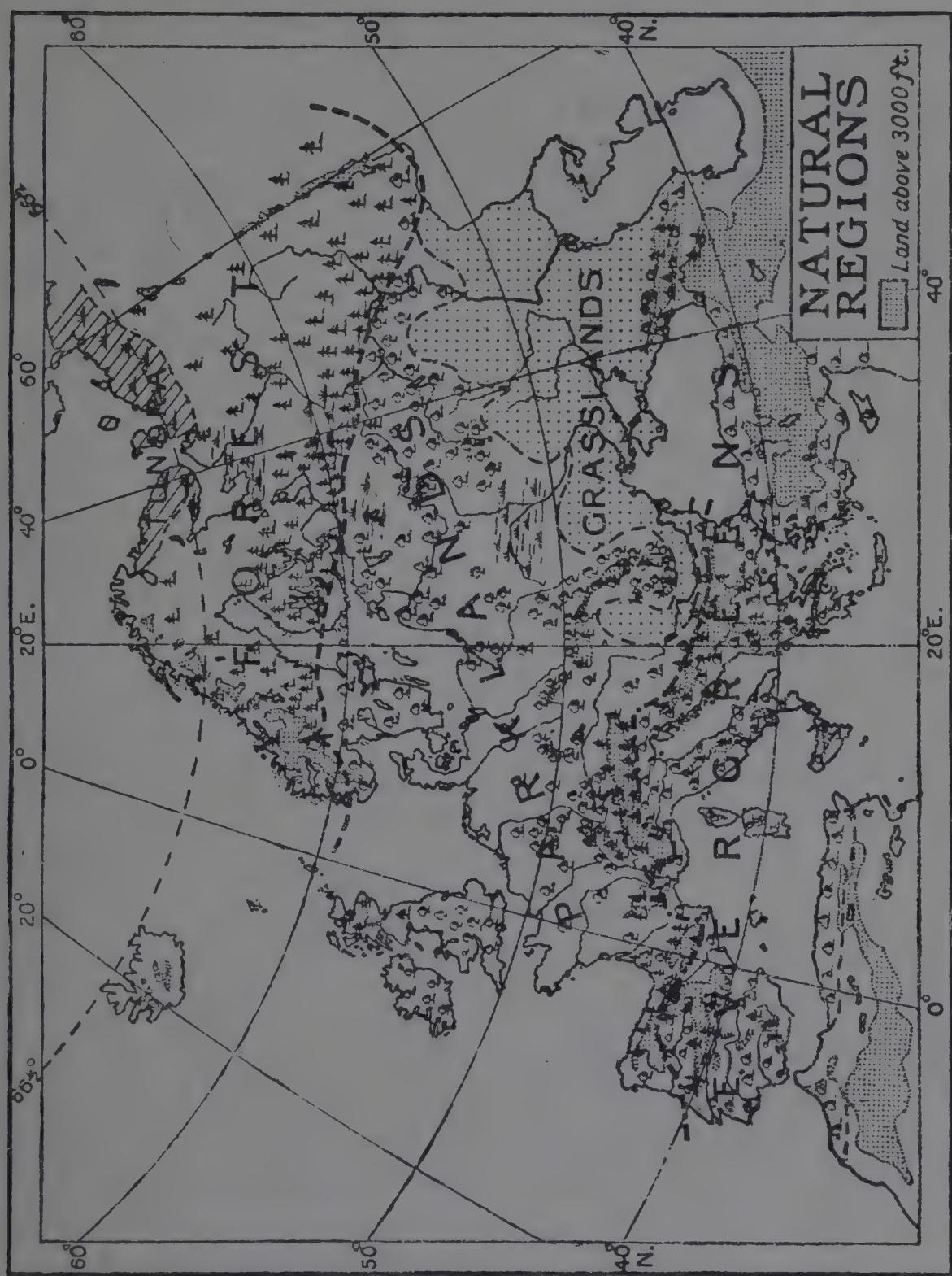


FIG. 9.

The belt of deciduous trees, *i.e.* those which shed their leaves in autumn, is not of course continuous. Almost everywhere ploughed fields and pastures are now eating into it and reducing its extent.

(4) Beyond the Alpine system lies the zone of the evergreens. Here we find a mild wet winter and a warm dry summer. The vegetation must hence be of the kind to resist the summer drought. The cypress and the laurel, the holly and the myrtle, are the typical trees.

(5) The Steppes. The drier grasslands of the temperate zone occur where the summer is warm and where the annual rainfall is too scanty to favour the growth of trees. Spring is the season when the earth is carpeted with flowers and rich grass. The rains of the summer thunderstorms do little more than soak the surface. This zone extends over the Plain of Hungary and the whole of Southern Russia.

6. Cultivated Plants.—Just as in the case of natural vegetation, climate mainly determines also the distribution of cultivated plants. It is not necessary for you to know where all the various crops are grown; only the more important are here noted.

(1) **Wheat.**—Wheat requires a warm, dry summer, long enough for the grain to ripen. The great plains of Southern Russia, the Plain of Hungary, and the river basins of France are the chief places of production. The first named is indeed one of the world's great wheat-growing regions. Here the rich soil, known as the Black Earth, assists a favourable climate. If we consider the extent of land under wheat cultivation in Europe, the countries stand as follows: Russia, France, Italy, Spain,

Rumania, Germany, Yugo-Slavia, Hungary, Poland. In the year 1928 France produced no less than 270 million bushels. Contrast this amount with the $45\frac{1}{4}$ million bushels grown in Great Britain.

(2) **Oats, Barley, Rye.**—These grains can endure a much more severe climate than wheat. Hence we find them grown in the colder districts of the wheat zone and to the north of that belt. Oats flourish in Britain, France, Germany, and Russia; barley chiefly in Russia, Spain, and Germany; and rye in Germany, Poland, the Baltic Republics, and Russia.

(3) **The Vine.**—France is the leading vine-growing country of Europe, and the wines of Burgundy, Bordeaux (claret), and Champagne are famous throughout the world. Other wine-producing countries are Spain (sherry), and Portugal (port), and Italy. The vine flourishes best on sunny slopes, especially on such as can catch the autumn sun.

(4) **Fruits.**—The Mediterranean is the chief fruit-growing region. The principal southern fruits are the olive, the orange, the lemon, and the peach. Farther north we find the walnut, plum, apple, and cherry.

Of the remaining numerous cultivated plants we may just mention these—maize, grown chiefly in Italy, Rumania, Hungary, and South Russia; potatoes, in France, Germany, and Poland; sugar-beet, in France, Germany, and Czecho-Slovakia.

[In Exercises Nos. 34 and 35, p. 43, you will find some statistics about the distribution of cattle and sheep. It would be well if these were worked at this point.]



CHAPTER III

EUROPE: INDUSTRY AND COMMERCE

7. Minerals.—Coal, by far the most important mineral of Europe, is found chiefly along the borders of the Central Highlands (see Relief (3)). Thus we have the coalfields of Britain, of the Central Plateau of France, of North France—Belgium—the Lower Rhine (from Lille through Mons and Liège to Dortmund), of the Saar Valley on the southern edge of the Rhine Plateau, of Saxony, of the Bohemian Plateau, of Upper Silesia, and of the Donetz Basin. Look for these places in your Atlas.

Some iron ore is usually found in the coalfields. Especially is this the case in the great coalfield of the Sambre-Meuse Valley, and in Saxony and Bohemia. Large deposits also occur separately in Sweden (Danne-mora and Gellivara), Lorraine, and in Spain. The Swedish ore is used in the manufacture of the finest steel.

Besides coal and iron, practically all the minerals are met with somewhere in Europe. Gold is mined in the Urals and in the Carpathians. The distribution of silver is pretty general, though the amount is not great. Lead and silver are usually found together. The most abundant supply of copper is obtained from Spain. The same country also possesses the mercury mines of Almaden, a metal whose ores are also found in Italy and Austria. Tin is not an abundant metal in Europe; the richest mines are found in Cornwall.

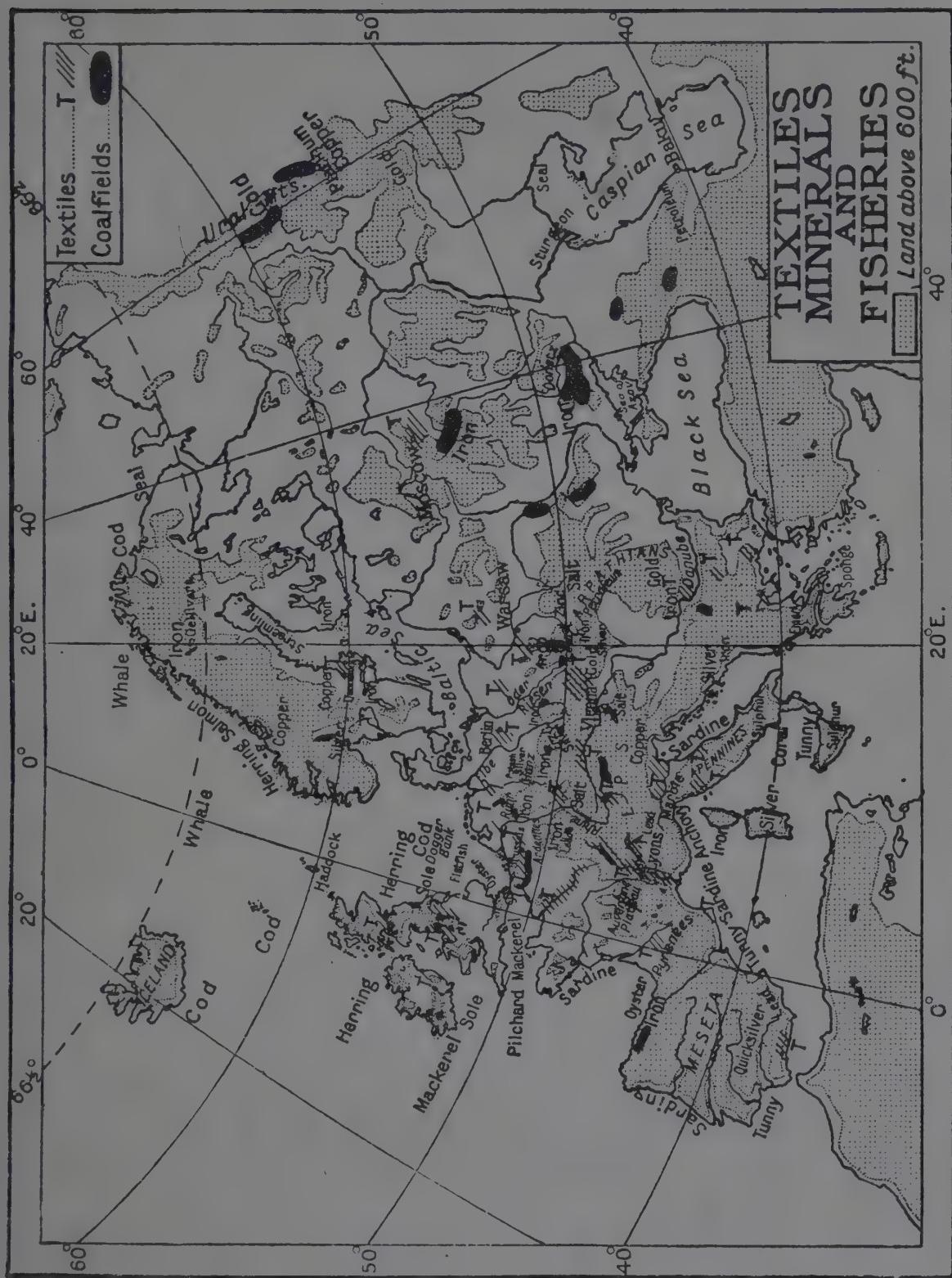


FIG. 10.

Apart from coal and the metals, the most important mineral products are oil (found as petroleum in Rumania and Poland and as shale oil in Scotland) and salt. Poland has the largest salt mines in the world.

8. Trade and Commerce.—We have now come to a subject which is not so easy to summarise or even to state simply. You can easily grasp a broad survey of the relief, and with the help of a few tables you may obtain a good idea of the climate. But it is not so simple with the industries and the commerce of such an active and complex continent as Europe. We shall therefore proceed in a somewhat different way, and study very briefly the exports and imports of a few countries, concerning ourselves with three main groups:

- (a) Foods and beverages, and tobacco.
- (b) Raw materials for manufacture, including coal.
- (c) Manufactured goods.

It is very difficult to compare the trade of different countries in money values now, as the rates of money exchange are still so unsettled after the Great War, but some percentage comparisons may help us.

The British Isles.—In 1928 the total imports of these islands were valued at £1,197,000,000; the total exports were £844,000,000, made up of £723,000,000 of domestic exports, and £121,000,000 of foreign and colonial produce which was being re-exported. Consider the first table very carefully.

This shows at once that the chief imports are foods and raw materials for manufacture, while the chief exports are manufactured goods. This conclusion is borne out by

enumerating the chief imports and exports in order of value, under different heads.

	Imports.	Domestic Exports.
(a) Foods, beverages, and tobacco	45 per cent.	7 per cent.
(b) Raw materials and coal . . .	28 ,,	10 ,,
(c) Manufactured articles . . .	27 ,,	80 ,,

Here is another table of the chief items, the amounts being given to the nearest million pounds sterling. Note carefully that only two chief imports can be classed as manufactures, and only one chief export as raw material.

Imports for 1928.	Exports for 1928.
Meat of all kinds . £(m.) 109	Cotton manufactures . . . £(m.) 145
Grain, meal, and flour . . . 107	Iron and steel manufactures . . . 67
Raw cotton . . . 81	Wool and worsted manufactures . . . 57
Raw wool and rags . . . 64	Machinery . . . 54
Wood and timber . . . 43	Vehicles (ships, locomotives, motor-cars, etc.) . . . 47
Oils, fats, resins . . . 38	Coal . . . 39
Copper, tin, zinc, aluminium, etc., and manufactures . . . 33	Linen, jute, artificial silk manufactures, etc. . . . 29
Iron and steel manufactures . . . 24	Apparel . . . 26
	Chemicals . . . 23

We shall now look at France from somewhat the same point of view but more briefly. Here is a similar table, giving the order of value only and not the values themselves.

Chief Imports for 1928.		Chief Exports for 1928.	
Raw wool . .	9·9 per cent.	Silk textiles . .	6·7 per cent.
Raw cotton . .	6·4 ,,"	Chemical manu-	
Coal and coke . .	6·0 ,,"	factories . .	6·4 ,,"
Oil seeds . .	4·9 ,,"	Cotton textiles . .	5·6 ,,"
Cereals . .	4·6 ,,"	Iron and steel	
Silk . .	4·3 ,,"	- manufactures	5·1 ,,"
Wine . .	4·2 ,,"	Clothing . .	4·1 ,,"
Coffee . .	3·3 ,,"	Motor-cars . .	3·0 ,,"
		Wine . .	2·0 ,,"

From this table it is at once seen that while France is largely a manufacturing country, she is not so dependent on supplies from other lands as are the British Isles. The total values of imports and exports are not so great as in Britain, and there is no one very great and outstanding article to compare with raw cotton and cotton goods in the British Isles.

Germany is also largely a manufacturing country, and in a recent year the manufactured articles amounted to 77 per cent. of the whole of the exports, while food and raw materials amounted to 70 per cent. of the imports.

Sweden may be studied as an example of a different kind of country. In the five years 1925 to 1928, the imports and the exports were nearly equal, the latter being

slightly the less of the two. The chief exports were: (1) wood-pulp and paper, (2) timber; the chief imports were: (1) coal, (2) metal goods and machinery, (3) cotton and woollen goods, (4) corn and flour.

Denmark is a country which produces chiefly one particular class of food-stuffs; these she exports. Her imports are other food-stuffs, coal, and manufactured goods. The chief exports are bacon, butter, and eggs, which make up about 80 per cent. of the total. The British Isles takes the biggest share of these exports. The four leading imports are: cereals, textile manufactures, metals and hardware, and coal, which are here named in the order of value in 1927.

Finally, we shall look at Hungary as one of the newly formed countries which is also largely dependent on its agriculture. The four leading imports, in order of value, were in 1927: wood and worked timber, cotton goods, coal, woollen goods; the three leading exports were : flour, sugar, cattle and horses. The exports worked out as follows: Foods, 80 per cent.; raw materials, 6 per cent.; manufactures, 14 per cent. It is not easy to work out the imports in the same way, but we know that manufactured goods came to more than 80 per cent. of the whole, and that foods do not find a place in the list.

9. Density of Population.—All told, Europe has roughly 450,000,000 of a population. Now this is a very striking fact. It means that, while Europe is next after Australia the smallest of the continents in area and has just about one-fifteenth of the world's land extent, its population is no less than one-fourth of the total world population. Further, while Asia has about 50 persons to

the square mile and Australia only 2, Europe has on an average over 100.

A map showing density of population in Europe is most interesting and instructive. In the first place, you should look on it for the regions with the least average density. Two of these will be easily found, and the reason for the scanty distribution there will be quite apparent. The first area forms a northern band through Sweden, Finland, and North Russia. The cause here is mainly climatic. The severe winter conditions and the cool summers are against the growth of crops. Agriculture then cannot be carried on to any great extent. Further, the situation and the general lack of minerals are against trade and industry. Another area includes places like North-west Scotland, Norway, the Alps, and the Carpathians. Here, of course, altitude is against man. He cannot grow his crops on the higher uplands.

Secondly, look for the areas of densest population. You will find them in portions of Britain, in Belgium, in parts of Germany, in Holland, and in North Italy. The first-named three are great industrial areas, where coal and iron are mined or where manufactures are carried on. The Plain of Lombardy has a dense population because of its great fertility, and the same is true of Holland.

[The Exercise No. 36, p. 43, showing the density per square mile for several of the countries, should be worked here.]

10. Railway Communication.—We shall study only the routes of international importance. In all cases trace the railway lines as you read, and carefully note how relief affects the direction of the routes.

(a) **The Orient Express Route.**—This great trans-continental railway starts from Paris and at first follows the Marne Valley. Between Châlons and Nancy it breaks through the French scarplands. The next obstacle is the Vosges. These heights are crossed at the Saverne Pass. The route reaches the Rhine at Strasbourg, crosses the river, and strikes northwards for some distance through the Rift Valley. Near Karlsruhe it gets through the Black Forest by a break known as the Gate of Pforzheim. This brings it to the Neckar Valley. Southwards the course is now through Stuttgart and the Swabian Jura to Ulm on the Danube. From Ulm the route cuts across the Danubian feeders at Augsburg, Munich, Rosenheim, and Salzburg. The railway now deflects north-east to Linz, and by the Austrian Gate reaches Vienna. From Vienna the course is south-east by the Carpathian Gate and the Upper Hungarian Plain to Buda-Pest. Southwards across the great plain itself the railway reaches Belgrade. The valley of the Morava carries it to Nish, whence the course runs by Sofia and along the Maritza Valley to Adrianople and then to Constantinople. An offshoot follows the Vardar Valley to Salonika.

(b) “**The Overland Route**” to the East.—Commencing at Paris, this route at first follows the Seine and Yonne Valleys. A break between the Côte d’Or and the Plateau of Langres brings it to Dijon. The course is now generally south-east by Macon and Chambéry to the Alps. The great mountain barrier is pierced by the Mt. Cenis tunnel, which brings the line by the Dora Riparia to Turin. From Turin it skirts the Apennines by Bologna and Ancona to Brindisi.

(c) **The Paris-Madrid Route.**—From Paris the route

keeps southwards to Orleans. Following the Loire past Blois the railway reaches Tours. Thence the course by the Gate of Poitou arrives at Bordeaux. It now skirts the Landes coast to Bayonne. A break between the Pyrenees and the Cantabrian Mountains furnishes a passage into Spain. From Vittoria the route runs south-west by Burgos, Valladolid, and Avila to Madrid. Continuations run to Lisbon and to Southern Spain.

(d) **The Paris—Berlin—Petrograd Route.**—From Paris this route at first strikes north-east. The Sambre-Meuse Valley carries the line past Namur and Liège. Along the northern base of the Rhine Highlands the course is to Köln (Cologne). Hence the route cuts through the busy Ruhr region and reaches Hanover by the Westphalian Gate. The central plain provides an easy way to Berlin. The line from the Hook of Holland, also a ferry-town, and from the Dutch cities, is linked to the Paris-Berlin section via Hanover. Eastwards from Berlin the route crosses the Oder and continues north-east by Königsberg and Vilna to Petrograd. From Berlin also a second eastern section runs via Posen and Warsaw to Moscow.

(e) **The Ostend-Brindisi Express Route.**¹—This runs from Ostend via Bruges, Ghent, Brussels, Namur, Metz, the Saverne Pass to the Rhine Valley, Basel, the St. Gothard Tunnel, Milan, Parma, Bologna, and Ancona, to Brindisi.

(f) **The Ostend-Orient Express Route.**—This also starts at Ostend. Hence its course runs by Ghent, Brussels, Liège, Köln (Cologne), the Rhine Gorge, Coblenz, Mainz, Frankfurt, Wurzburg, Nuremberg, Ratisbon, Vienna, Buda-Pest, Szegedin, Temesvár, the

¹ This once famous route is little used now.

Iron Gates, and Bukarest, to Kustenji and Varna. These are in steamer communication with Constantinople.

EXERCISES

1. Many atlases contain a map showing land and water hemispheres. What is Europe's position in the former?
2. Name the nine peninsulas of Europe, and the capes which end these.
3. Make a list of the rivers which rise in the Alps.
4. Find any parts of the European plain which lie below sea-level.
5. Name at least twelve ports at river-mouths on the coast of Europe.
6. Which rivers possess deltas?
7. Make a list of at least a dozen lakes of Europe, and name the countries in which they lie.
8. Trace the boundary-line between Europe and Asia. At what point is there no definite frontier?
9. Give the latitude and longitude of Madrid, Stockholm, Vienna, Constantinople, Moscow, Rome, Paris, Christiania (Oslo), and Berlin.
10. Using the scale on your atlas map, measure these distances: North Cape to Cape Matapan; Lisbon to Moscow; the head of the Adriatic to the mouth of the Vistula; the Gulf of Lions to the Bay of Biscay.
11. Group the rivers of Europe under the following drainage heads: Arctic Ocean, Atlantic Ocean, North Sea, Baltic Sea, Mediterranean Sea, Black Sea, Caspian Sea.
12. Carefully trace on your map the main watershed from the source of the Guadalquivir in Spain, round the head of the Ebro, between the Loire and the Rhone, round the head of the Rhine and the Danube, and then north-east by the sources of the Oder, Elbe, Vistula, W. Dwina, N. Dwina, and Volga, to the Urals.

13. From the following approximate lengths of the chief rivers in miles, draw a comparative diagram: Volga, 2300; Danube, 1800; Dneiper, 1330; Rhine, 800; Elbe, 720; Vistula, 650; Rhone, 500; Seine, 480.
14. After the pattern given on page 14 make a sketch map of the Valdai Hills centre of river radiation.
15. Trace the line of 50° N. latitude from west to east, and name the rivers crossed by it.
16. Study the coast line of Europe in your atlas. Make the following headings and under each heading compile a list: inlets (seas, bays, gulfs and estuaries), capes, straits, peninsulas, and islands.
17. Make a special study of straits and isthmuses. Say in each case the seas joined and the lands linked.
18. Compare or contrast the Mediterranean and Baltic seas in respect of position, size, depth, entrances, islands, and entrant rivers.
19. Examine the seabards of the countries of Europe, and then classify these under three headings: (a) those possessing no seaboard at all; (b) those possessing a short seaboard for their size; and (c) those possessing a long seaboard for their size.
20. Draw a map of the Mediterranean. Insert thereon, besides the usual physical features, the ports and river-mouths, and indicate by arrows the pathways from the sea inland by rivers and passes.
21. Make a section across Europe along the line of 10° east longitude.
22. Draw a sketch map of the English Channel, Strait of Dover, and southern North Sea area. Insert thereon the inlets, capes, and ferry-towns.
23. As a class exercise take the following four special areas: (a) the Bay of Biscay from Ushant Isle to Cape Ortegal; (b) the Adriatic to the Strait of Otranto; (c) the Baltic entrances; and (d) the Black Sea. Distribute these in order round the class and make detailed sketch maps.
24. Study the Rhone basin after the pattern of the brief

studies given in the text of the Rhine and the Danube.
Make sketch maps of the three river basins.

25. Make careful sketch maps of the following Gates: Gate of Carcassonne (G. of Lions and Bay of Biscay); Gate of Poitou (Loire and Garonne); Burgundian Gate (Saône and Rhine); Moravian and Silesian Gates (Danube and Oder).
26. Make a list of the chief Alpine passes. In each case mention the river valleys connected, and state whether the pass carries a railway line.
27. Examine the frontier lines of the countries, and make up a tabular list under these headings:

Rivers.	Mountains.	Countries Separated.

28. Make a list of the States round (1) the Baltic, and (2) the Mediterranean. Give their capitals.
29. Note carefully the routes commanded by Paris and by Vienna. Draw diagrams. This is a valuable exercise as a basis for later studies of town sites.
30. Make several climate graphs and diagrams from the lists of statistics given under Climate. Such exercises are particularly helpful. They bring out climate better, perhaps, than any amount of general description. A few special exercises may be indicated:
 - (a) On an outline map show the four temperature regions.
 - (b) Show by a diagram the increase in range of temperature from west to east.
 - (c) Put into diagram form the four sets of rainfall figures.
 - (d) Make graphs to show the difference in rainfall distribution between Plymouth (West) and Rome (Mediterranean), and between Brest (west) and Kiev or Moscow (east).

(e) Look for distinct rain-shadows on the rainfall map.

31. From the following list of chief towns, draw a diagram to show their relative sizes:—

London, 7,500,000; Berlin, 3,800,000; Paris, 2,900,000; Vienna, 1,860,000; Hamburg, 985,000; Buda-Pest, 930,000; Brussels, 780,000; Madrid, 750,000; Amsterdam, 700,000; Naples, 700,000; Copenhagen, 670,000; Marseilles, 580,000; Lisbon, 500,000; Stockholm, 420,000.

32. The following are the percentages of the total population of several countries engaged in (a) Agriculture; (b) Industries; (c) Commerce. Make sets of comparative diagrams.

- (a) Hungary, 68; Italy, 59; Austria, 58; Russia, 58; France, 42; Germany, 37; Britain, 12.
- (b) Britain, 56; Germany, 37; France, 35; Italy, 24; Austria, 22; Russia, 18; Hungary, 13.
- (c) Britain, 12; Germany, 12; France, 9; Italy, 7; Austria, 7; Russia, 7; Hungary, 4.

33. Show by separate diagrams how the land is used in the countries named. The figures are approximate percentages.

Country.	Under Cultivation.	Pasture-land.	Woods.	Un-cultivated.
Britain .	13	65	4	18
France .	58	11	16	15
Germany .	49	16	26	9
Norway .	2	2	22	74
Hungary .	61	19	12	8

34. Construct comparative diagrams to show the number of cattle for some of the countries. The figures are in millions. Germany, 17; France, 13; British Isles, 12; Italy, 6; Czecho-Slovakia, 5; Hungary, 4.
35. Do the same for sheep. British Isles, 24; Spain, 20; Italy, 12; France, 10; Germany, 6.
36. Below are given the densities of population per square mile for a number of States. Prepare diagrams to illustrate these figures by drawing blank inch squares and dotting into these the densities given. See that you keep your dots in regular lines and equally distributed within the separate squares.

England, 680; Belgium, 650; Holland, 550; Britain, 390; Germany, 300; France, 200; Spain, 100; Greece, 90; Russia, 70; Sweden, 30; Norway, 20.

CHAPTER IV

ASIA

1. General—Size and Extent.—You will remember how, when we were dealing with Europe, we laid stress on the point that the smaller continent was but a western peninsula of Asia. In our study of the larger continent we shall have occasion more than once to refer to the same fact.

Like Europe, the west-east breadth of Asia is greater than the north-south length. Like Europe, too, the continent faces three oceans and has one land boundary. On the north lies the Arctic Ocean, on the east the Pacific, on the south the Indian, while the boundary with Europe is neither clear-cut nor natural. With Africa the continent is connected by the narrow isthmus of Suez. Between Asia and Australia lies the Malay Archipelago group of islands. Here it is somewhat difficult to find a good boundary line. A line called Wallace's Line, which runs by the Macassar Strait, between Celebes and Borneo, and by the Strait between the two small islands of Bali and Lombok, divides Asiatic and Australian plants and animals.

To emphasise the huge size and extent of Asia these facts ought to be kept in mind:

(1) the total land surface of the globe is 55,000,000 square miles, and the total land surface of Asia is 17,000,000; in other words Asia occupies close on one third of the world's land extent;

(2) by comparison, Asia is nearly six times the size of

Australia, four and a half times the size of Europe, two and a half times the size of South America, twice the size of North America, and one and a half times the size of Africa;



FIG. 11.—Generalised physical Map of Asia.

- (3) the continent stretches from within 1° of the Equator to within 13° of the North Pole;
- (4) from west to east it extends through 160° of

longitude, *i.e.* through nearly one half of the total circumference of the globe.

For its huge size Asia is, however, a very compact continent. Thus, though in area it is four and a half times Europe, its coastline is in length not twice that of the smaller continent.

2. Relief.—Look closely at the physical maps of the two continents. Without going very deeply into the matter, you will be able to note some rather striking points of comparison. In the first place, Europe has a number of islands on its western seaboard, while Asia has an island-fringe on its eastern coast. The British and Japanese groups may be looked upon as parallels. Note again how Scandinavia is paralleled by Kamchatka and Korea by Denmark. Further, if you regard the Indian Ocean as a parallel to the Mediterranean Sea, you will see that in both continents there is a series of three southern peninsulas. And even within the double set a close comparison can be made. Note (*a*) the general appearance of the peninsulas: Iberian and Arabian, Italian and Indian, Balkan and Indo-Chinese; (*b*) the fact that both the western ones are very close to Africa; (*c*) the islands at the tips of the central pair; and (*d*) the islands which stretch away eastwards from the projections of the eastern pair.

The relief system of Asia appears from the physical map somewhat complicated. There are, however, a few clearly marked divisions.

(1) In the north-east of the great land-mass are the North-eastern Highlands. These are very old, much worn-down mountains, and are in fact the parallels to the North-west Highlands in Europe. Take the river Amur

as the southern boundary. To the north of this lies a rather confused region, stretching from the Upper Irtish to Bering Strait. Within this you will note three plateaux—the Plateau of Kobdo, the Vitim Plateau, and the Stanovoi Plateau. You may regard these as the parallels to the plateau of North-west Ireland, the North-west Highlands of Scotland, and the Scandinavian Plateau. The first is bounded by the Altai Mountains on the south and the Sayan Mountains on the north. It is doubtful if these are Alpine ranges; possibly they are just the edges of the plateau. The second, the Vitim Plateau, is bounded on the west by the Baikal Mountains and on the east by the Yablonoi or Trans-Baikal Mountains. The third, or Stanovoi Plateau, lies to the west of the Sea of Okhotsk and of the Bering Sea. The Mongolian Plateau, part of which is occupied by the Gobi or Shamo Desert, links the North-eastern Highlands with the Great Central Mountains. The eastern edge of this plateau goes by the name of the Khingan Mountains.

(2) The second section of the relief of Asia, the Northern Lowland, is a continuation of the European Plain. (Perhaps we ought to read this statement the other way about.) This Northern Lowland extends from the Caspian Sea away north-eastwards to the shores of the Arctic Ocean. In the extreme south-west is the Plain of Turan or of West Turkestan, drained by the Amu Daria and Syr Daria into the inland Sea of Aral. A low ridge separates the Plain of Turan from the Great Siberian Lowlands. As your map will show you, these are readily divisible into three parts. On the west is the plain of the Ob and of its tributaries the Irtish and the Tobol. Then comes a low platform, bounded and drained by the

Yenisei and the Lena. Thirdly, beyond the Lena is a higher section, enclosed within the curve of the Stanovoi Mountains and the Arctic Ocean.

(3) We come now to the Asiatic portion of the great mid-old world fold system. To this we have often referred. Lofty and lengthy as are the European mountains which form the Alpine part of this system, they cannot be compared either in height or extent with the Asiatic mountains. Here we have the greatest mountain mass in the world.

The Asiatic section extends from the Ægean and Black Seas to the Malay Peninsula. Within it three separate chains may be traced. Follow these carefully in your map. The northern chain includes the Caucasus and the Tian-Shan. It is not continuous. The central chain is well marked. It includes the Pontic Mountains (to the south of the Black Sea), the Elburz Range (to the south of the Caspian Sea), the Hindu Kush, the Pamirs, and the Kwen-Lun. Between the northern and the central chain is a number of depressions—the Black Sea, the southern part of the Caspian Sea, the southern area of the Turan Basin, and the Tarim Basin with Lob Nor. The southern chain comprises the Taurus Mountains (the southern edge of the tableland of Asia Minor), the Zagros Mountains, the Sulaiman Mountains, and the Himalayas. Between the central and the southern chain is a number of plateaux (not depressions)—Asia Minor, Armenia, Kurdistan, Iran, and Tibet. The highest peak in the great belt is Mount Everest, which reaches a height of 29,000 feet. Mont Blanc, the loftiest summit of the Alps, is just a little over half this height.

(4) The Marginal Lowlands. Their best marked portions are the Plain of Mesopotamia or Iraq (the basins

of the Euphrates and Tigris) and the Plain of Hindustan (the basins of the Indus and Ganges). Areas of less extent are the basins of the Lower Irawadi, Menam, and Mekong in Further India. The lowlands have been largely built up by river deposits.

(5) To the south of the Marginal Lowlands are the two tablelands of Arabia and the Deccan. It is believed that these are remnants of an ancient southern continent which at one time may have girdled the southern hemisphere.

(6) The Eastern Volcanic Chain. This fringes the Pacific coast of Asia from the peninsula of Kamchatka through the Kurile, Japanese, Lu Chu, and Philippine Islands. The whole region possesses many volcanoes and is subject to earthquake shocks.

3. Rivers.—Within Asia there are five well-marked drainage areas—Arctic, Pacific, Indian, Atlantic, and Inland. In our short survey we shall not attempt to deal with these in detail. We must be content with the table (on the next page) showing the chief rivers in the separate areas and with notes on the rivers of first-rate importance.

The Yang-tse-Kiang (3400 miles)¹ is Asia's longest river, but even it ranks only fourth in the world's rivers. America possesses the Mississippi-Missouri, 4200 miles in length, and the Amazon, 4000 miles, while Africa has the Nile with its 3700 miles. After the Yang-tse-Kiang come the three Siberian rivers—the Yenisei (3200 miles), the Ob (2800 miles), and the Lena (2800 miles). But since these empty themselves into the Arctic Ocean and since their lower courses are frozen for a large part of the year, they are not to be regarded as great waterways. The same is true of the Amur, despite its length of 2700 miles.

¹ The lengths of rivers given are always approximate.

The Yang-tse-Kiang rises in the Plateau of Tibet. At first its course is south-eastwards, but in the complex region of South-west China the river turns abruptly northwards and then eastwards. Two of its right-bank feeders leave

Drainage Area.	Rivers.
(a) Arctic . . .	Ob, Yenisei, Lena.
(b) Pacific . . .	Amur, Hwang-ho, Yang-tse-Kiang, Si-Kiang, Mekong, Menam.
(c) Indian . . .	Shat-el-Arab (Euphrates and Tigris), Indus, Ganges, Brahmaputra, Irawadi, Salween.
(d) Atlantic . . .	The short rivers of Asia Minor and Syria.
(e) Inland . . .	Sea of Aral—Amu Daria, Syr Daria. Dead Sea—Jordan. Tarim and Balkash drainages.

large lakes just before entering the parent stream. It has often been noted that these lakes act as regulating reservoirs, and thus prevent the floods which are so common in the Hwang-ho Valley. The river enters the East China Sea by a delta.

The Hwang-ho or Yellow River (2500 miles) has a most curious course. Like its sister stream it takes its rise in the Tibetan Plateau. On its way to the sea it also twists about abruptly, at first to the north, then to the east, next to the south, and lastly eastwards again. During a most disastrous flood in 1852 the river broke through its left

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MUR

bank and completely changed its lower course. Before that year it entered the Yellow Sea to the south of the Shantung Peninsula; it now enters the Gulf of Pechili to the north of the peninsula.

The basins of the Ganges (1500 miles) and the Indus (1800 miles) form the great Indo Gangetic Plain. Indeed the lowlands here have been built up by deposits brought down by the rivers from the gigantic mountain system. It is said that the soil is so fine that scarcely a pebble can be found. The divide between the two river basins is low, and it seems that the head-streams of the Upper Ganges and Jumna at one time flowed south-west to the Arabian Sea. Study carefully the two rivers and their tributaries. Note in succession the mountain feeders of the Ganges—Jumna, Gogra, Gandak. It is remarkable that some tributaries rise on the northern side of the main ridge of the Himalayas, while the Upper Ganges itself rises on the southern side. From the south two other feeders are the Chambal and the Son. The Brahmaputra (1800 miles) rises on the north side of the Himalayas, and in its upper course occupies the same valley which carries the Sutlej to the Indus in the opposite direction. After running for a great distance parallel to the main range, the river abruptly breaks through in a huge valley-cleft. Its course is now parallel to the mountains, but on the southern side. Turning again in its track round the hills of Assam it enters the Ganges delta. The two enormous streams here form the Sundarbans, a region of muddy swamps and dense jungles, scored by creeks innumerable. In the Indus Basin note the five rivers (Punjab = the Land of the Five Rivers)—Sutlej, Ravi, Chenab, Jhelum, and Upper Indus. The mouth of the Indus is also deltaic.

CHAPTER V

ASIA: CLIMATE AND VEGETATION

4. Climate.—Let us first state a few factors which influence the climate of Asia. Note these very carefully, for at your stage they are perhaps more important than a full study of the climate itself.

(a) The continent is an enormous land-mass. Remember that Europe is an extension, and that we are dealing with Asia as by far the larger section of Eurasia.

(b) The continent is for its great size not deeply indented. We have already mentioned the compactness of Asia.

(c) Like Europe, Asia's largest bulk is within temperate latitudes. Most of the three southern peninsulas, however, lie south of the Tropic of Cancer, and the tip of the Malay Peninsula almost reaches the Equator.

(d) Note the position of the Mid-Old World Fold Mountains, that great belt of plateaux and mountain ranges which extends right across the south-central part of Asia. From the Taurus to the Himalayas the belt acts as a barrier to the influences of the southern seas. Contrast Europe, where the chief factor to influence climate is the western ocean and where no great mountain barrier checks the influence of the Atlantic.

(e) The long northward slope to the Arctic Ocean intensifies the effect of (d).

(i) **Temperature.**—The remarkable thing about the

isotherms for January is their parallelism. From the 60° F. line, which skirts the north of the three peninsulas, to North-east Siberia there is a steady and a fairly regular drop in temperature. Note how the isotherms bend northwards when they reach the Pacific Ocean, for the air temperature over the sea is higher than the air temperature

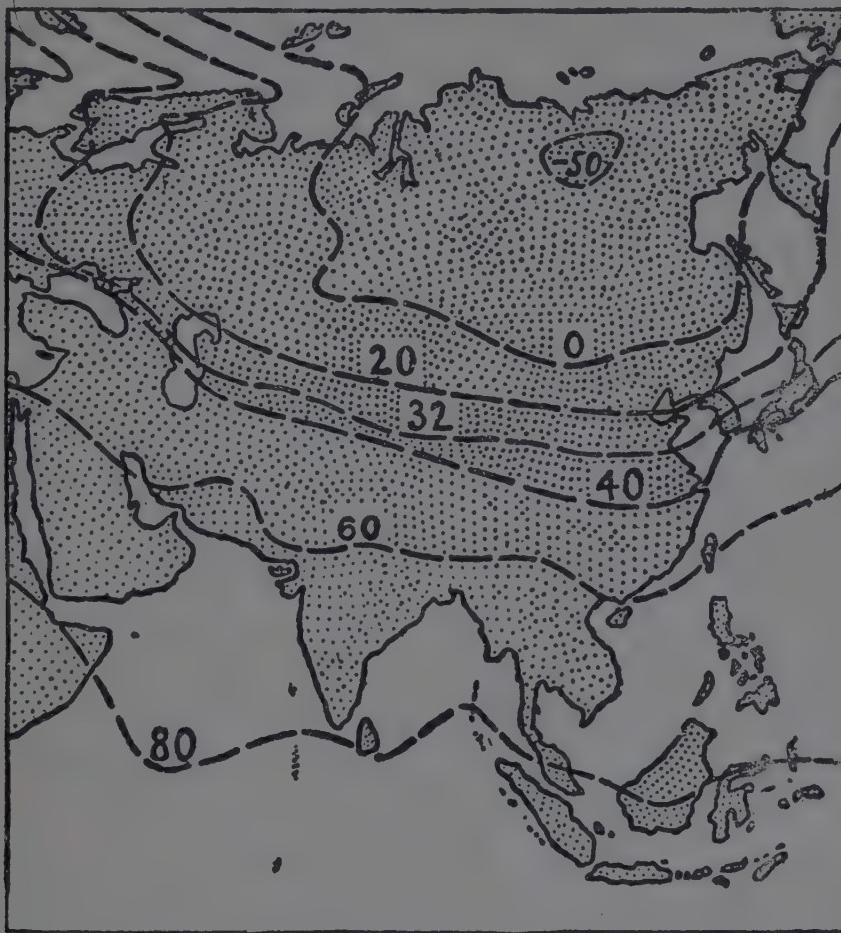


FIG. 12.—Asia. January temperature.
(Figures are degrees Fahrenheit.)

over the land. The "cold pole" of the world lies round Verkhoyansk, where the average January temperature falls to -50° F. The 32° F. line crosses the Caspian Sea, the Mongolian Desert, and the Korean Peninsula.

For July also the isotherms are more or less parallel and regular. Note how they bend southwards when they reach the Pacific Ocean, since for the summer season the

air temperature over the sea is lower than the air temperature over the land. A large area, covering most of Arabia, Persia, and Afghanistan has a temperature of over 90° F., while the 70° F. line reaches the north of Lake Baikal.

(2) Rainfall.—A study of the mean annual rainfall map shows a number of most useful facts. (a) The first

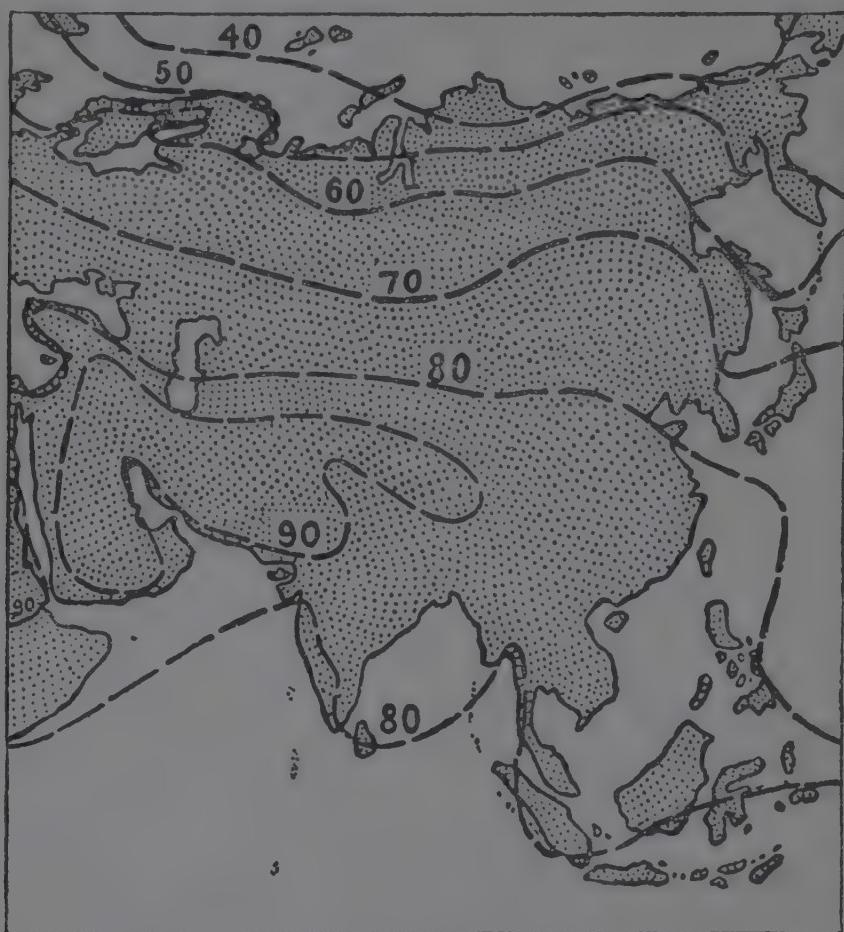


FIG. 13.—Asia. July temperature.
(Figures are degrees Fahrenheit.)

fact is that four great patches have less than 10 inches of rainfall in a year—the Turkestan basin, the extreme north-east section of Siberia, the plateau of Tibet, and the plateaux of Arabia and Iran. Look now for the causes. The Turkestan basin is dry because it is so far from the ocean. No westerly winds bring their burden of moisture. The extreme north-east is dry because of the cold. Where

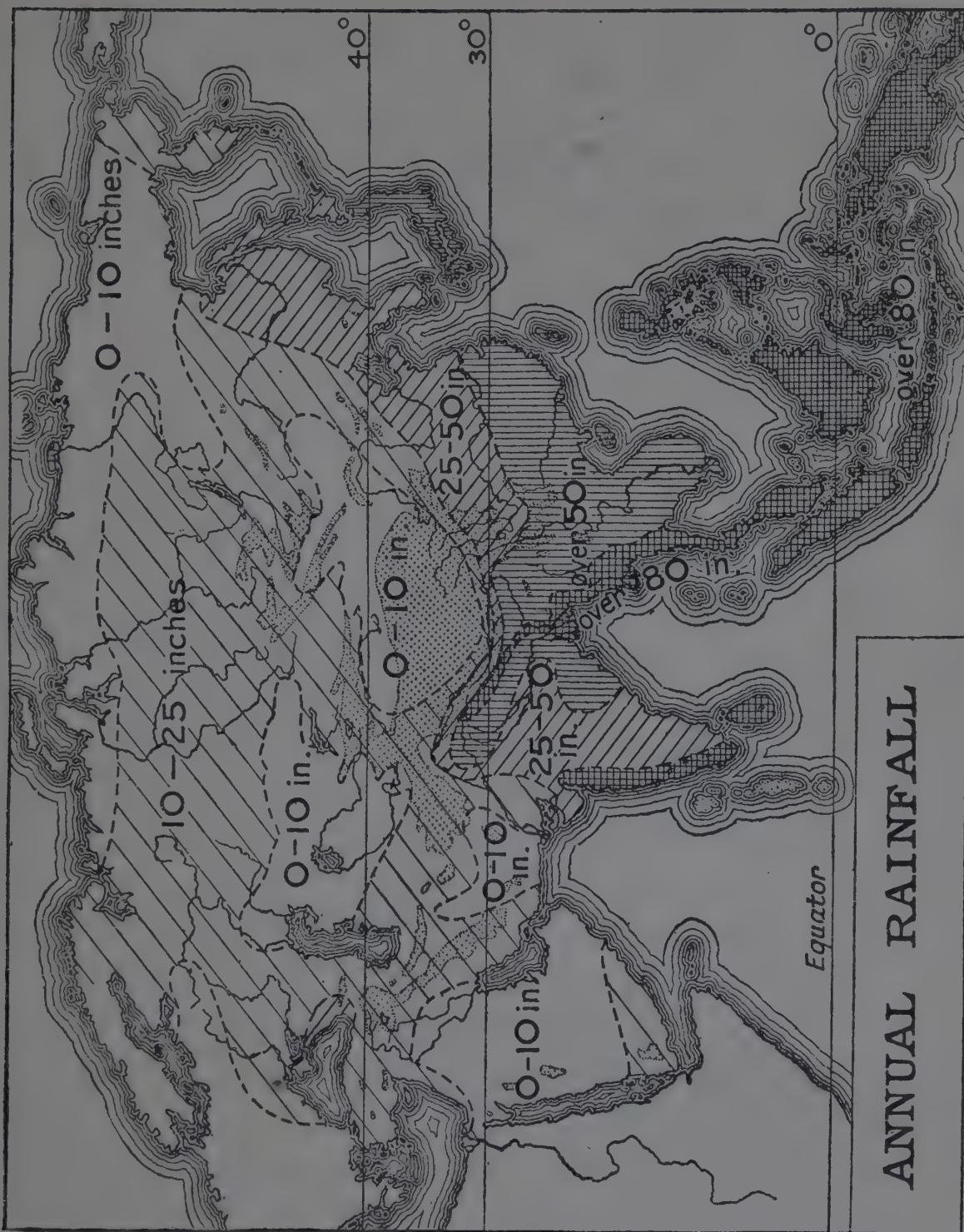


FIG. 14.

there is little or no evaporation, there can be little or no rainfall. The central plateaux are dry because of the mighty mountain barrier which so effectively screens off the influence of the southern ocean. The south-west is practically a desert because it is untouched by the south-west winds and because the north-east winds come over land and therefore are dry. (b) The second fact is that, apart from the dry patches mentioned, all Western and Central Asia receives some rainfall, though this is very seldom heavy. Again we can discover the causes. Western Asia, *i.e.* the Asia Minor and Syrian region, is in the Mediterranean zone and gets its rainfall in winter. Central Asia's rainfall comes mainly in summer when the temperature is very high and when thunderstorms are frequent. (c) The third fact is that most of India, Indo-China, and South China has some rain at all seasons. It is heaviest in summer when the south-west monsoon blows. (d) The fourth fact is that along the east coast we have a region where the rainfall, though it also comes chiefly in summer, is not quite so heavy as in the places mentioned under (c). Within the area there are two portions, a northern and a southern. The distinction is due perhaps more to temperature than to amount of rainfall. In the northern section are included Korea, Manchuria, and North China; in the southern section Japan and Central China.

We are especially interested in the Indian Empire, so it is well to deal with its climate somewhat more fully. The Indian year is divided into two seasons:

- (1) the season of the north-east monsoon,¹ and
- (2) the season of the south-west monsoon.

¹ The word "monsoon" means "season," and the monsoonal type of climate is experienced not only in India, but in the extreme southwest of Arabia, in the Indo-China Peninsula, and in China.

The first lasts from January to mid-June, the second from mid-June to December. But both of these main seasons can be sub-divided. Within the first we have (*a*) the cool weather season in January and February, and (*b*) the hot weather season from March to mid-June. Within the second we have (*a*) the season of heavy rains from mid-June to mid-September, and (*b*) the season of retreating rains from mid-September to December.

Let us start in January and try to follow all these. Since there exists a tremendous barrier of mountains along Northern India we need not try to look beyond India itself for the cause of the changes. January and February are cool because of the latitude. Do not be misled by the word "cool." For India the months are cool, for Britain they would be warm. Indeed the temperature for January and February is just as high as for July in Britain. They are the most pleasant months in India. The temperature ranges from 55° F. in the Punjab to 75° F. in the Southern Deccan. The wind is generally from north-east to south-west and is very light. The rainfall is not by any means heavy. The only place which has heavy rainfall is the east of Ceylon, since the north-east monsoon has crossed the Bay of Bengal and is moisture-laden.

The hot season begins in March. The sun is now moving northwards. By May the whole of India is an area of very high temperature. In the heart of the peninsula for this month there is an area where the temperature is over 95° F. On the west coast it reaches 85° F. and on the east 90° F. The winds are on-shore winds. This means that, where hills skirt the coast, the rainfall will be rather heavy. We find this to be the case especially in the extreme south-west, in Ceylon, and in Assam.

By mid-June the temperature conditions mentioned in the last paragraph have become extreme. The south-east trades of the South Indian Ocean are now drawn across the Equator and have become south-west winds. Hence from mid-June to mid-September we have the season of general heavy rains. The monsoon winds are

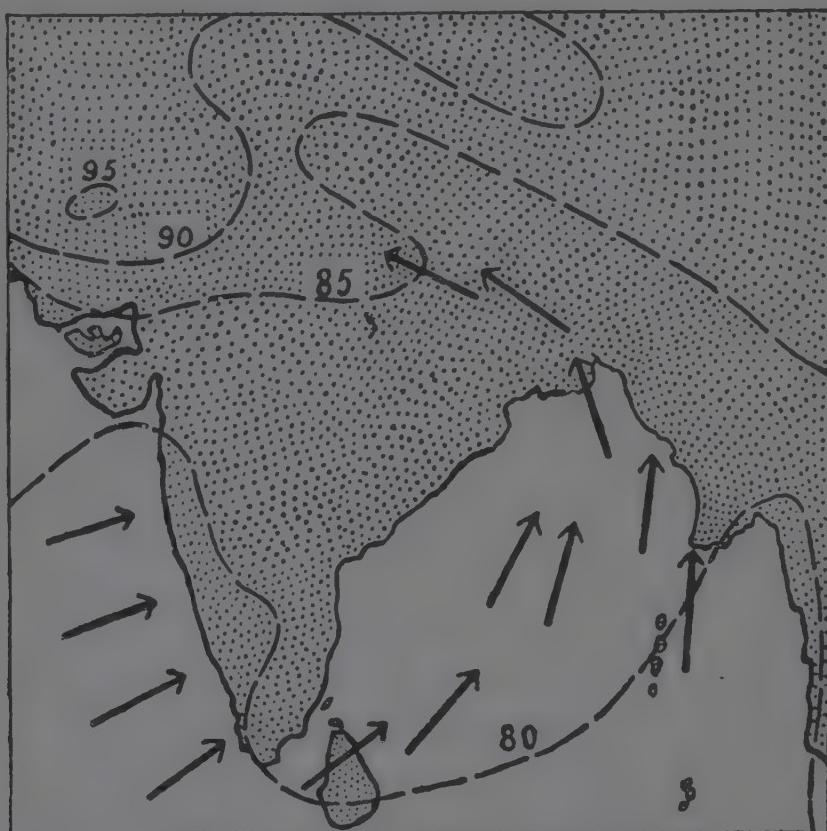


FIG. 15A.—India. July temperature in degrees Fahrenheit ; arrows show the general direction of winds during the south-west monsoon.

heading for North India rather than for Central Asia ; they have come across a vast sweep of waters, and they are meeting uplands in their track. On the west, where the Western Ghats are directly in the path, the rainfall is heavy, averaging over 75 inches, while in many places on the windward slope it reaches 100 inches. East of the Western Ghats there is a distinct rain-shadow, where the

rainfall drops to 40 inches and even to 20 inches. The same thing is seen quite clearly in Ceylon, where the rainfall grades off from 75 to 20 inches. East of the Central Deccan, in the hilly region beyond the Godavari, the rainfall again increases, and a large area has between 40 and 75 inches. To the east of the Bay of Bengal we have a repeti-

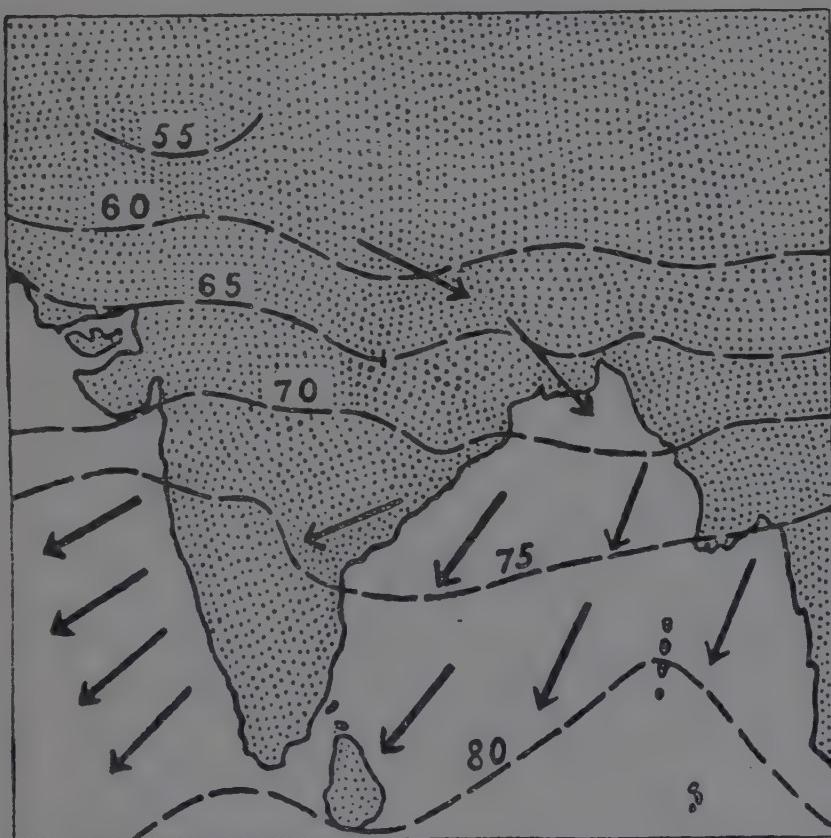
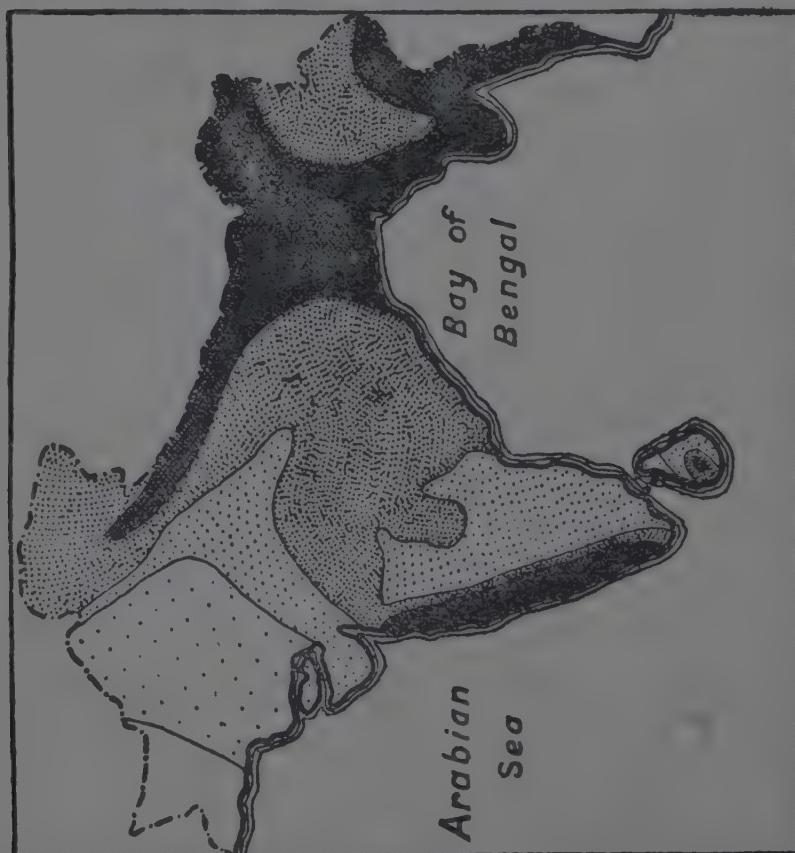
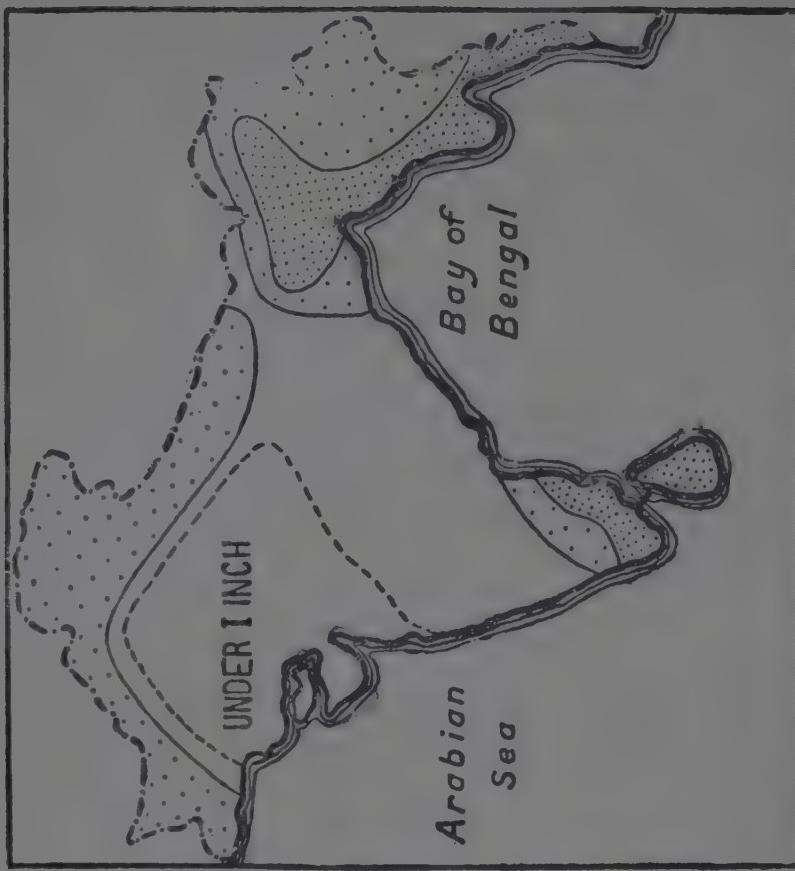


FIG. 15B.—India. January temperature in degrees Fahrenheit
arrows show the general direction of winds during the north-east monsoon.

tion of west coast conditions. In the hills of Assam and Burma the rainfall is extraordinarily heavy. Cherrapunji, in the Khasi Hills, has the reputation of having the heaviest rainfall in the world. Its mean annual rainfall is 458 inches, and 41 inches, which is almost twice as much as Cambridge has in a year, have actually fallen in one day! The plain of the Ganges gets its rain from the Bay



INDIA Winter Rainfall (Nov to Apr)
Regions with under 5" (in the six months)
5"-10"
10"-30"
30"-50"
over 100"

FIG. 16.

of Bengal monsoon, which is deflected from its south-west-north-east path by the Himalayas. Hence as we proceed farther from the sea the rainfall amount gets less. In the north-west of the peninsula the winds have crossed Afghanistan and Baluchistan and are dry. If any portion of the Indian Ocean south-west monsoon did reach the Indus Valley, it would in its course be crossing a plain and no fall would result. (What then are the three causes which have produced the Thar Desert?)

From September to December we have the season of the so-called retreating south-west monsoon. The sun is now shifting southwards. At first temperature conditions are pretty uniform, but gradually the north gets cooler. The direction of the wind changes from south-west to north-east. Only in the south-east of the Deccan coast and in Ceylon is there any large amount of rainfall.

5. Vegetation.—In all there are ten fairly distinct vegetation regions in Asia. Let us briefly consider these in turn.

(a) **The Tundra.**—This is a continuation on a much larger scale of the similar zone in Europe. It includes most of the land within the Arctic Circle. Here we have a treeless waste fringing an ocean whose coast is icebound for the greater part of the year. As the rivers flow from south to north, their upper courses are open while the lower courses are frozen over. This results in great areas of swampy lowlands. Within the zone there are two main types, known as the moss tundra and the lichen tundra. As is to be expected, the former occurs in the great hollows where huge peat mosses have been laid down. The latter needs a drier soil. Here in the brief summer, and in

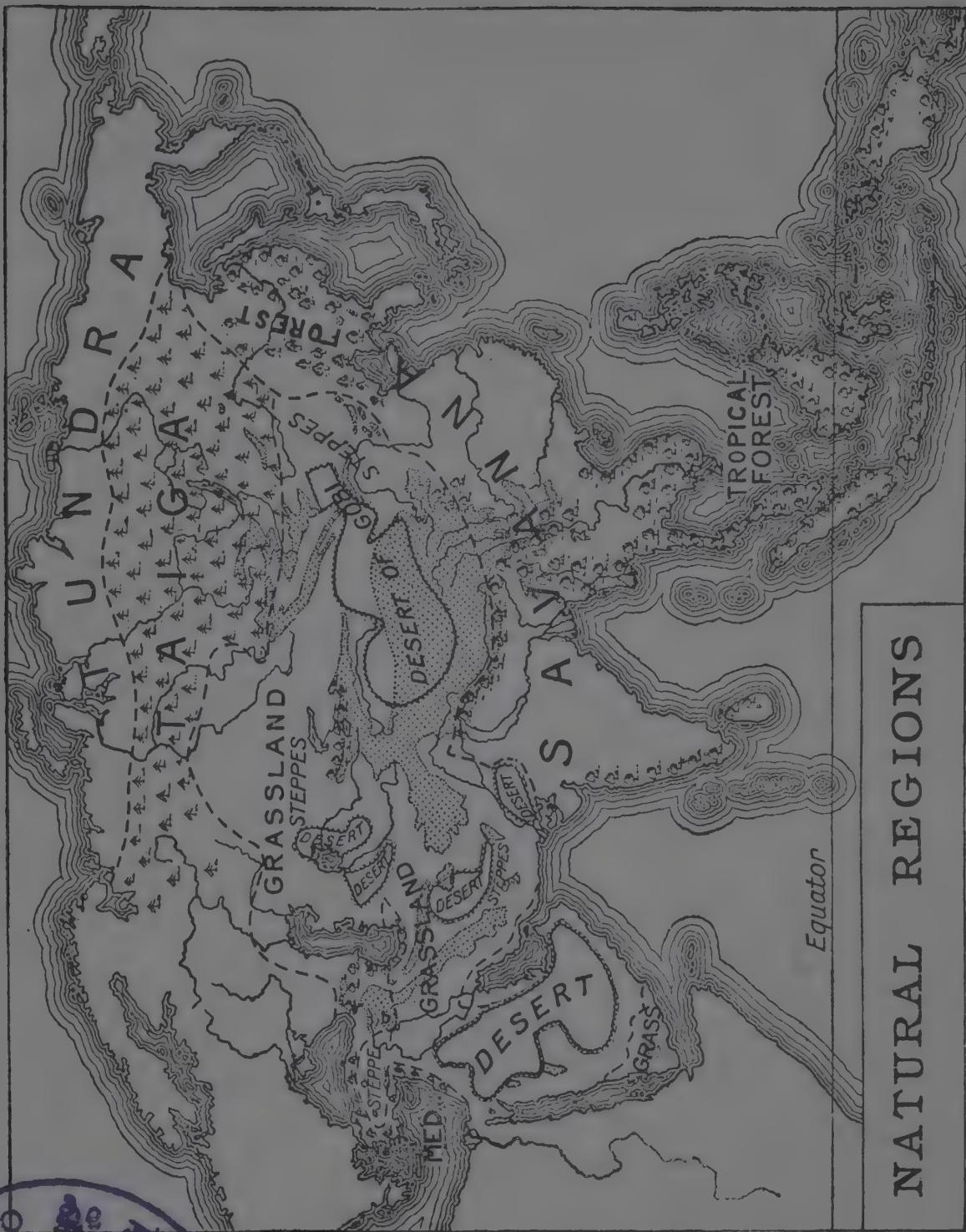


FIG. 17.

NATURAL REGIONS

particular on the sunny slopes, a carpet of flowers relieves the monotony of the landscape. No cultivation can be carried on. Fishing along the coast, and along the rivers when they are not frozen, and hunting are the occupations of the scattered population. The tundra is the land of the reindeer. Over most of the region the ground is permanently frozen at a depth of one foot.

(b) **The Coniferous Forest Zone.**—This centres about latitude 60° and extends from the Urals to the Peninsula of Kamchatka, from the swampy flats of the Ob to the Stanovoi Range. Like the tundra, this zone, known as the *taiga*, is continued from Europe. In this case also the extent is very much greater. In the higher and drier parts, especially of Eastern Siberia, enormous forests of spruce, pine, and larch cover the ground. These shelter the fur-bearing animals. Indeed the region is perhaps the world's most extensive breeding area.

(c) **The Temperate Forest Zone.**—In Amuria, Manchuria, and North China, *i.e.* on the Pacific border where the rainfall is sufficient, we find the deciduous trees such as the oak, beech, and birch. Lumbering may yet become as important here as in Canada. The chief difficulty will be in establishing sufficient means of transport.

(d) **The Grasslands Zone.**—This is best seen in the basins of the Upper Ob, Tobol, and Yenisei from the Southern Urals to Lake Baikal. The rainfall is enough for the growth of a grass covering and yet not sufficient to further the growth of trees. We are now in the steppes proper. Just as the tundra is the zone of the reindeer and the taiga the zone of the fur-bearing animals, so the steppes are the zone of the grazing animals. The population is nomadic, and the life of its people centres round

the tending of the flocks and herds. The zone may yet become one of the world's wheat-producing areas.

(e) **The Temperate Deserts.**—These form a sort of sub-zone within the steppes. Where the rainfall is scanty, the grass covering becomes thin or even non-existent. The region is found round the Sea of Aral. In the main it is a mixture of sandy wastes with fertile irrigated strips along the rivers. By means of irrigation, crops of wheat and maize, and even of tobacco and cotton, can be produced.

(f) **The Monsoon Region.**—This is an area where the rainfall is as a rule abundant. Its extreme northern section we have put under (c), though, as regards winds and rainfall, the whole coast from India to Amuria is monsoonal. Within the region are the so-called savanna lands with less heavy rains. These are thus not fully forested but have grasslands mingled with woodlands. The Deccan is a type. Here the rains are fairly heavy, and we find dense forests in some parts. Teak, bamboo, the coconut palm, and the mangrove are typical trees of the more southern lands of the region.

(g) **The Tropical Forests.**—In this vegetation zone we have a very high temperature and very heavy rainfall at all seasons. The Malay Archipelago is the typical area. The forests are dense, and, apart from such trees as are mentioned under (f), the chief vegetation products are rubber, bananas, spices, coffee, and breadfruit.

(h) We need merely mention the Mediterranean region. It is continued from Europe into Asia Minor and Syria, though eastwards and south-eastwards, as the temperature increases and the rainfall decreases, the region shades off into the temperate and the hot deserts. The typical pro-

ducts are fruits—the olive, the vine, and the orange. The region is famous for its tobacco.

(i) In Arabia we have a hot desert area like the Sahara. The peninsula is not wholly an arid, sandy, or stony waste. Where the rainfall is slight, where the temperature is moderated by height, and where oases occur, there is vegetation. The typical product is the date palm. Parts of Iran and of India (*i.e.* the Thar Desert) are closely akin to Arabia.

(j) **The Central Mountain Zone.**—In the great belt of mountains and plateaux the climate is too severe for the growth of much vegetation. A little agriculture can be carried on in the sheltered valleys. In the main the inhabitants are shepherds. It is interesting to note how the altitude zones repeat the latitude zones as we ascend the mountains. From the hot plains of the Ganges, through the monsoon forests, the deciduous trees, the conifers, the shrubs, the grass, we climb to the wastes of perpetual snow.

Asia is so vast in size, so diverse in build, and so varied in climate, that its productions are naturally exceedingly numerous. Since the continent extends from the Equator to the Arctic Circle, practically every cultivated plant which we mentioned in the case of Europe is found also in Asia. But we should require to add to the list such plants as grow in warmer climates than Europe possesses, for Asia extends much farther south. Here is a brief list of Asia's main vegetable products. Only those countries are stated which rank among the world's chief producers.

Product.	Countries.
Coconut . . .	India, Ceylon.
Cotton . . .	India, China.
Dates . . .	India, Arabia.
Jute . . .	India.
Millet . . .	India, China.
Oranges . . .	China, Japan.
Quinine . . .	Ceylon.
Rice . . .	Japan, India, China, ¹ Siam.
Rubber . . .	Ceylon, Malay Archipelago.
Sago . . .	Moluccas, Philippines, Borneo.
Silk . . .	China, Japan.
Sugar . . .	Java, India, Philippines.
Tea . . .	India, Ceylon, China, Japan, Java.
Teak . . .	India, Burma.
Tobacco . . .	India, China, Syria.
Wheat . . .	India, Manchuria.

¹ Treaties forbid the export of rice and other cereals from China proper.

CHAPTER VI

ASIA: INDUSTRY AND COMMERCE

6. Minerals.—Asia is rich in minerals. As in the case of Europe, the mineral wealth is found, not in the central fold ranges, but in the older mountains, *e.g.* in those of Siberia, China, and the Deccan.

For its great size the Indian Empire has not yet yielded abundant mineral wealth. Coal is found in the central and eastern region from the Ganges to the Godavari. If we take the mouth of the Mahanadi as the centre of a semi-circle of which the diameter extends from the mouth of the Ganges to the mouth of the Godavari, then this figure includes most of the coal-producing districts of the peninsula. The distribution of iron is much more general. Bengal supplies mica, and Central and Southern India manganese. For these two India stands in the front rank of the world's list of producers. In Burma are found tin and precious stones. The island of Ceylon is one of the world's chief sources for plumbago, called also graphite. Salt, the production of which is in the hands of the Indian Government, is a very valuable source of wealth. Apart from the minerals mentioned, gold, silver, copper, lead, and diamonds are found in India.

China possesses great stores of minerals, many of them practically unworked. Coal and iron, gold, silver, copper, and precious stones, and kaolin are all found within the country. If China had skilled labour, good means of transport, and a settled Government, it must take rank as

one of the world's greatest mineral producers. As regards coal alone China could become one of the first coal countries of the world.

Japan is also fairly rich in minerals, especially copper, sulphur, and coal. Like China, too, the island group has huge deposits of kaolin.

From the Malay States comes at least half the world's total supply of tin.

Gold and fossil ivory are the main mineral products of Siberia. The Lena Basin is a world-supply area for the latter.

Petroleum is found chiefly in four regions in Asia—round Baku, in Mesopotamia and Persia, the Irawadi Basin, and the East Indies.

7. Trade and Commerce.—We shall not enter into great detail in the case of a continent of the size of Asia, but confine our attention to a few outstanding facts in connection with imports and exports. In order of total value of imports the chief countries rank as follows for the last year for which returns are available:

Japan, 245;¹ India, 178; China, 161; French Indo-China, 44; Siam, 14; Persia, 11.

By far the most important imports are cotton goods. Next take exports. In order of total value the chief countries rank as follows:

India, 273;¹ Japan, 180; China, 131; French Indo-China, 46; Siam, 18; Persia, 13.

The most important exports are raw cotton, rice, raw silk, tea, and rubber.

Now look at the total trade, *i.e.* both exports and imports. Apply the name "customer" both to the state which

¹ The figures represent million pounds sterling.

exports goods to, and to the state which imports goods from, an Asiatic country. Then Britain is by far India's best customer; Japan and China are each other's best customers; Indo-China naturally carries on most of its trade with France; Turkey in Asia's heaviest trade item relates to Britain, and the same is true for Persia.

8. Density of Population.—A map would show you that there is a very close connection between rainfall and density of population.

In general, the monsoon region from the Indus to the Amur is densely peopled. Within the area three sections are very densely peopled—the Ganges Basin, North and Central China (especially the basins of the two great rivers), and Japan. Here there are more than 250 persons per square mile. Apart from the Ganges Basin, almost all the rest of India has between 125 and 250 persons per square mile. Lying between India and China is the Indo-China Peninsula, where the density is between 25 and 125 persons per square mile. Coming now to the other region of Asia, viz. the Mediterranean area, we find here, too, that there is a close relation between rainfall and population, for Asia Minor and Syria, Armenia and Kurdistan, have between 25 and 125 persons per square mile. The temperate and hot deserts, *e.g.* Mongolian, Turkestan, and Arabian, have under 2 persons per square mile. Such a low density is found also in the barren tundra of Siberia and in the bleak plateau of Tibet. Within the steppes, in the lower districts of Iran, Afghanistan, and Baluchistan, and in the fertile spots of Arabia, the density occasionally rises to nearly 25 persons per square mile. The total average density per square mile is about 50.

It has been estimated that the total world population is 1,800,000,000. Of this vast number something like 1,000,000,000 persons live in Asia. Within Asia, China possesses about 435,000,000¹ and India 315,000,000.

9. Railway Communication.—A railway map of Asia looks rather blank compared with a similar one for Europe. We do not find in the larger continent, with its great desert expanses and its northern wastes, the same network of railway lines which covers the smaller. Only in India is there anything like an extensive railway system. From Europe three systems stretch eastwards and southwards towards the Pacific and Indian Oceans. Below are short notes on these and on the Indian railways.

(a) The Trans-Siberian Railway is the only railway which fully crosses the continent. At Chelyabinsk, just beyond the Urals, the Asiatic section of this railway makes its start. The European section runs from Petrograd through Moscow to Samara. In the long track from the Urals to the Pacific Ocean the line passes through lands varied not only in relief but in productions and occupations. On the west the region is steppe-land, very like the prairies of Canada. Here cereals are grown, and sheep, goats, horses, and cattle are reared in large numbers. The chief towns of this portion are Omsk, where the line crosses the Irtish, and Tomsk, a university town reached by a short branch-line. Both are wheat markets. Beyond Omsk the route traverses the coniferous forest belt, crossing the Yenisei at Krasnoyarsk. Just east of Lake Baikal, Irkutsk, the largest town in Siberia, is passed. Formerly a train-ferry crossed

¹ There is a good deal of doubt about the figures for China.

the lake, but now the line has itself been continued round the southern end. The mountainous region now reached is very rich in minerals, as yet little worked. Vladivostok, the terminus on the Pacific coast, is icebound for a considerable part of the year. A branch-line from Harbin runs south through Manchuria to Port Arthur.

(b) The Turkestan Railway commences at Krasnovodsk, a port on the Caspian Sea opposite Baku. There are two sections of this railway, one from Krasnovodsk, through Merv, Bokhara, and Samarkand, the other from Samara, through Orenburg to the Sea of Aral. The latter follows the course of the Syr Daria to Tashkent, south of which it joins with the Caspian line. The joint railway-line continues to Khokan, where two lines diverge, one to Namangan, the other to Andijan. From the "main" line two almost parallel branch-lines lead to the Afghan frontier, one from Merv, the other from Bokhara.

(c) The Baghdad Railway starts from Scutari, opposite Constantinople, and crosses Asia Minor to Aleppo. On the way a branch runs to Angora, and another joins from Smyrna. The Taurus Mountains are pierced at the Cilician Gates. From Aleppo the route crosses to the Euphrates Valley, and when completed will run through Iraq via Mosul to Baghdad. As yet sections on each side of Mosul are not finished. Beyond Baghdad the line runs to Basra, the port of Mesopotamia. From Aleppo the very important Syrian-Hejaz branch runs south through Damascus to Medina.

(d) The Indian Empire system. In India there are three main railway routes. You will best remember these by regarding Calcutta as the centre. From this great port the routes radiate as follows: (1) to Peshawar,

(2) to Bombay, and (3) to Madras. (1) The first route follows the Ganges Valley to the capital, Delhi, by Patna, Allahabad, Cawnpur, and Agra. From Delhi the route continues by Amritsar and Lahore to Peshawar and the Khyber Pass. This great Indo-Gangetic Plain route has several branches. One branch runs parallel to the main line by Benares and Lucknow. From Delhi two branches radiate. One skirts the Aravalli Hills by Jaipur and Jodhpur to Bombay, the other passes to the Sutlej Valley to join the Punjab route from Peshawar to Hyderabad and Karachi. (2) The Calcutta-Bombay route crosses the Deccan by the Upper Mahanadi and Godavari through Nagpur. It is linked to (1) by a connection from Allahabad. (3) The Calcutta-Madras route follows the Bay of Bengal coast. From Madras three routes cross the southern Deccan—to Bombay via Poona, to Goa, and to Calicut.

We have briefly indicated the routes of these railways, but it may be as well in the case of India to give you the actual names of the railway lines. These are: the East Indian Railway from Calcutta to Lahore; the North-western Railway from Peshawar to Karachi; the Great Indian Peninsular Railway from Bombay to Allahabad, to Calcutta, and to Madras, and from Calcutta to Madras; and the Madras Railway from Madras to Calicut.

EXERCISES

1. Using the scale on an atlas map of Asia measure the distances from the Strait of Bab-el-Mandeb to the Bering Strait, from Cape Chelyuskin to Cape Romania, and from Smyrna to Shanghai.
2. Name the capes terminating the three southern peninsulas.

3. Make a fairly full list of the islands of Asia.
4. Do the same with the openings (seas, bays, gulfs) of the Pacific and Indian Ocean coasts.
5. Write a short note on the likeness between the south of Europe and the south of Asia.
6. Make a section across the Continent along the 90° line of longitude.
7. On an outline map sketch in the relief system of Asia. Show the mountain ranges by heavy lines. Shade in deeply the plateaux, and dot in lightly the plains.
8. Draw a physical map of India. With India you should make yourselves familiar.
9. Select a scale and make a diagram to show the heights of these mountains :

Mt. Everest (Himalayas), 29,000 feet; Mustag Ata (Pamirs), 24,500 feet; Mt. Demavend (Elburz), 18,500 feet; Mt. Ararat (Armenia), 17,000 feet; Mt. Blanc (Alps), 15,800 feet; Fuji Yama (Japan), 12,350 feet.

10. The Pamir Plateau is often called "The Roof of the World." Regard it as the central knot of the mountain system of Asia and draw a diagram to show five radiating mountain lines.
11. From the following approximate figures make a diagram to show the comparative lengths of certain rivers of Asia :

Yang-tse-Kiang, 3400 miles; Yenisei, 3200 miles; Ob, 2800 miles; Lena, 2800 miles; Amur, 2700 miles; Hwang-ho, 2500 miles; Brahmaputra, 1800 miles; Indus, 1800 miles; Euphrates, 1700 miles; Ganges, 1500 miles.

12. Make a diagram to show the following areas of the basins of some of the chief rivers. The figures are given in thousands of square miles:

Yenisei, 1500; Ob, 1100; Lena, 900; Amur, 750; Yang-tse-Kiang, 700; Ganges, 600; Hwang-ho, 400; Indus, 350; Mekong, 250.

13. Trace on your map the watersheds of the four drainage areas mentioned in the text. Trace also the main watershed of the Continent from the Ægean Sea by the headstreams of the Euphrates and Tigris, the Amu Daria and Syr Daria, the Ob, Yenisei, and Lena, to East Cape.
14. The following are a few temperatures ranges. Can you explain the differences?

Singapore, 3° F.; Bombay, 10° F.; Allahabad, 33° F.; Irkutsk, 70° F.; Verkhoyansk, 118° F.

15. Show by three graphs the monthly temperatures of Colombo, Benares, and Tobolsk. The figures are degrees F.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Colombo—	79	80	80·5	81·5	82	80·5	80	80·5	80·5	79	79·5	79
Benares—	60	65	76·5	87	91	89	84	83	83	78	68	60
Tobolsk—	—2	4·5	15	33	48	59·5	66	60	48	32·5	14	1·5

16. Make a diagram to show the mean annual rainfall figures for these places in India and Ceylon:

Colombo, 88 inches; Bombay, 74 inches; Calcutta, 61 inches; Madras, 49 inches; Delhi, 28 inches; Karachi, 8 inches.

17. The following places are in the Ganges Basin, and the figures show how the rainfall decreases as we leave the sea. Put the figures into diagram form.

Calcutta, 61 inches; Patna, 44 inches; Benares, 41 inches; Allahabad, 39 inches; Cawnpur, 32 inches; Delhi, 28 inches.

18. Show by three simple diagrams how the rainfall decreases
(a) from east coast to the interior; (b) from west (Mediterranean) to the interior; and (c) from south to north.

(a) Tokio, 58 inches; Peking, 25 inches; Kashgar, 3·5 inches.

- (b) Smyrna, 15 inches; Teheran, 9 inches; Merv, 7 inches.
 (c) Colombo, 88 inches; Cawnpur, 32 inches; Tobolsk, 18 inches.

19. Below is given the yield in million bushels for one year of the four chief wheat-growing countries of Asia. Make a comparative diagram.

India, 390; Siberia, 105; Japan, 25; China, 6.

20. Similar figures in million lbs. are given for cotton. Do the same in this case.

India, 1460; China, 210; Turkey, 50; Persia, 24; Indo-China, 20.

21. Try the same type of exercise for the minerals. We give in the first place the tin output:

Malay States, 35,000 tons; Dutch East Indies, 20,000 tons; China, 10,000 tons; and, for the sake of comparison, Britain, 1000 tons.

Next, the figures show the coal output in million tons:

Japan, 16; India, 13; China, 10; Siberia, 2.

Again, for petroleum, in thousand tons:

Persia, 4500; India, 1100; Japan, 200; the East Indies, 2800.

Lastly, the gold output in 1000 lbs.:

Siberia, 52; India, 32; China, 30; Japan, 10.

22. Here are given the densities of population for several countries. Once again show these by a diagram.

Japan, 290 persons per sq. mile; India, 180 persons per sq. mile; China, 100 persons per sq. mile; Burma, 60 persons per sq. mile; Siberia, 4 persons per sq. mile.

23. Draw a sketch map to show the position of Singapore. Note especially the four seaways converging on it.

Your map should include Siam, the Malay Peninsula, Sumatra, Java and Borneo.

24. Find in your atlas map the Cilician Gates, the Kyber Pass and the Zungarian Gate. What do you think is the importance of each?
25. Make a sketch map of the position of Delhi. Note especially the lowland between the Himalayas and the Aravalli Hills and the watershed between the Indus and Ganges Basins.

CHAPTER VII

AFRICA

1. General—Size and Extent.—Africa is the second largest of the continents. It occupies one-fifth of the world's land surface and is three times the size of Europe. Note how the Equator crosses the continent almost midway between its most northerly and southerly capes. On each side of the Equator, Africa extends for about 35° of latitude. This means that both tropics also cross the continent. In fact Africa is the only continent cut by the three lines. It does not follow that Africa has an equal bulk to north and to south of the Equator. Indeed the portion crossed by the Tropic of Cancer is twice as wide as that crossed by the Tropic of Capricorn.

Africa is a vast peninsula, linked to Asia by the narrow isthmus of Suez. This "bridge" between the two continents has now been cut through by a canal. Africa approaches Europe very closely at two points—at the Strait of Gibraltar, which is only 9 miles wide, and at the Strait of Tunis, about 80 miles wide. You should compare the Mediterranean Sea and the Red Sea. Note that the Strait of Gibraltar is comparable to the Strait of Bab-el-Mandeb which is 14 miles wide.

The boundaries of Africa are very obvious. On the west lies the Atlantic Ocean, on the east the Indian Ocean, while their arms, the Mediterranean Sea in the one case and the Red Sea in the other, form the northern and north-

eastern boundaries. The narrow land boundary at the bridge-isthmus of Suez is 80 miles across.

Your physical map will show you how compact Africa is. Indeed it is the most compact of all the continents. Africa is much more of an island than Europe is, yet the coast-line of Europe is 23,000 miles as against 19,000 miles in the case of Africa. This is due, of course, to the distinct lack of openings—the coast is very far from being deeply indented. Apart from the “horn of Africa,” ending in Cape Guardafui, there are no peninsulas.

2. Relief.—Not only is Africa the most compact of the continents, it is also the simplest in build. Practically the whole of the continent is a plateau. Apart from the marginal plains round the coast there are few lowlands. It has been often remarked that, were the waters of the surrounding oceans to rise 600 feet above their present level, the outline of Africa would be very little altered. That would not be the case with Asia, and would certainly be very far from being the case with Europe.

As regards structure one portion of the great peninsula requires special mention. Someone once said that Africa began beyond the Pyrenees. For our purpose it would be more true to say that Europe extends beyond the Mediterranean Sea. The mountains in Tunisia, Algeria, and Morocco are not at all like the mountains of the rest of Africa. They are fold mountains, and form part of the great mid-old world fold system already described. With the exception, then, of the mountains in the extreme northwest, Africa is a plateau. Within the plateau there are two main divisions, differing rather in height than in structure. The physical map will show you what is

meant. If a curved line be drawn from the north of the Abyssinian Mountains by Lake Albert to the mouth of the Congo, the portion of the plateau to the south and south-



FIG. 18.—A generalised physical Map of Africa.

east of this line is generally much higher than the portion to the north and north-west of it. In fact the former is on an average twice as high.

We may therefore regard Africa as having four main relief divisions : (a) the Atlas Mountains ; (b) the marginal lowlands ; (c) the North-west Plateau ; and (d) the South-east Plateau. These we shall take in order.

(a) **The Atlas Mountains.**—These are linked on the west with the Sierra Nevada of Southern Spain and on the east with the mountains of Sicily. In other words, the Atlas Mountains form part of the loop which rings the western basin of the Mediterranean. This has been already mentioned. We must be careful not to speak of the Atlas Mountains as though they were one single range. As a matter of fact they consist, like the Alps, of three parallel ranges. Further, there is a Moroccan or western section and an Algerian or eastern section. In the latter we should note the Alfa Plateau between the Tell Atlas and the Saharan Atlas. This plateau gets its name from the alfa or esparto grass which grows there. Within the tableland there are many swampy salt lakes called *shotts*. In the rainy winters these are greatly increased in size. The highest peak of the Atlas system rises to about 15,000 feet.

(b) **The Marginal Lowlands.**—These are nowhere of any great extent. Four areas may be mentioned—the plain to the south of the Gulf of Sidra ; the Cape Verde Basin occupied by the Senegal and Gambia Rivers ; the Guinea coastlands, especially the delta of the Niger ; and the narrow strip along the east coast from Ras Hafun to the mouth of the Limpopo.

(c) **The North-west Plateau.**—The greater part of this is occupied by the Sahara Desert, extending from the Nile westwards to the Atlantic Ocean. The relief is not easy to describe. A long ridge, running from about Lake Albert north-westwards to the Algerian Atlas, cuts the great

desert in two. To the north-east of this diagonal ridge lies the Libyan Desert. To the south-west of the ridge are two lower portions of the tableland—the Lake Chad region and the region to the north of Timbuktu. The Asben Plateau,¹ a minor ridge, separates these two regions. On the south of the North-west Plateau lie the Kamerun Mountains and the mountains, sometimes known as the Kong Plateau, which skirt the Upper Guinea coast. Add to these the basin of the Middle Congo, and you have the main features of this third relief division. Note once more, and follow on your map, the four depressions, the long diagonal ridge, the minor ridge, and the two southern mountain masses.

(d) **The South-east Plateau.**—This is a great mass of high land stretching from the Red Sea on the north to the very southern tip of the continent. It thus includes the whole of Africa south and east of the Upper Nile and Upper Congo. Perhaps the easiest plan of description is to regard this relief division as consisting of three plateaux—the Abyssinian Plateau, the Great Central or Equatorial Plateau, and the South African Plateau. The first is a very compact area within which the highest peak rises to 15,000 feet. On the east the plateau descends very sharply, on the west and north the slope is gentle, on the south high land links it with the second tableland. Lake Tana occupies the centre of the Abyssinian mountain knot. The Blue Nile and the Atbara carry the heavy rainfall of this region to the Nile. The region of the great lakes—Rudolf, Albert, Edward, Victoria, Tanganyika, and Nyasa—forms the Central or Equatorial Plateau. In the very heart of the region is Lake Victoria. To the east of

¹ Or Aïr Plateau.

this great sheet of water are the volcanic peaks of Elgon, Kenya, and Kilimanjaro, the last over 19,000 feet in height. To the west of the lake rises the mountain mass of Ruwenzori. South of the Zambesi is the South African Plateau. This everywhere descends sharply to the narrow marginal lowlands. Within the plateau are three subdivisions—the Matopo Plateau between the Zambesi and the Limpopo, the Damanama Plateau to the north of the Lower Orange River, and the High Veld stretching from the Limpopo almost to Cape Town. On the east the High Veld ends in the broken edge or escarpment, called the Drakensberg Mountains; in the extreme south it falls by a series of terraces known as Karroos. The counterpart to the Sahara is the Kalahari Desert, crossed by the Tropic of Capricorn.

3. Rivers.—Though Africa possesses four of the world's longest rivers, the continent cannot be said to have a rich supply. As we shall see later, large areas are rainless or almost so. The three greatest rivers—the Nile, the Congo, and the Niger—rise in Equatorial Africa; the Zambesi, Limpopo, and Orange belong to the South-eastern Plateau. Lake Chad and Lake Ngami, both basins of inland drainage, receive a few streams from the surrounding areas. These lakes belong to the north and south regions of little rain.

(a) **The Nile.**—The Nile is perhaps the most remarkable river in the world. A small stream, the Kagera, rising to the north-east of Lake Tanganyika, forms the head-waters. This flows into Lake Victoria, the second largest freshwater lake in the world and as big as Scotland. Leaving the north end of the lake, the river forms

the Ripon Falls, passes through the swampy Lake Kioja, and enters the north-east corner of Lake Albert, which is linked to Lake Edward by the Semliki River. As it issues from Lake Albert the Nile forms the Murchison Falls. The course is now northwards for a considerable distance, till the Bahr-el-Ghazal joins on the left bank. There the Nile turns east to the junction of the Sobat. From this point to the confluence of the Blue Nile at Khartum the main river is called the White Nile. From the Abyssinian Highlands come the Blue Nile and the Atbara. Between Berber and Aswan the Nile makes a huge bend. Five cataracts occur here. These are rapids formed by the river falling over hard rocks which it has not yet been able to wear away. Below Aswan the Nile receives no tributaries; for a distance of 1800 miles it crosses a rainless desert. The Mediterranean Sea is entered by a delta, of which the two chief distributaries are called Rosetta and Damietta after the ports.

The striking feature in the Nile's flow is the annual rise. The steady, regular volume of water is maintained by the Upper Nile and its feeders from the Equatorial region of very heavy rainfall. The flood comes from the rains of the Abyssinian Mountains. The mountain feeders in heavy spate bring down enormous quantities of fine sand and mud. When the waters retire from the flooded fields the silt is left. On this the fertility of the Nile Valley depends. "The Nile is Egypt and Egypt is the Nile." Great barrages or dams have been and are being constructed. Behind these the flood-waters are stored, to be spread at will over areas which otherwise could not be reached. Large tracts are thus being irrigated and made to produce crops.

The Nile is the longest river of the Old World and the third longest in the world. It has a total length of about 3700 miles. Beyond Aswan, owing to the cataracts, it is not as yet of much use for navigation.

(b) **The Congo.**—The Congo (3000 miles) also rises in the Equatorial Plateau. A tiny river, entering Lake Bangweolo, may be regarded as its head-stream. Flowing northwards, the Congo passes through Lake Mweru and receives the Lukuga, which drains Lake Tanganyika, said to be the longest freshwater lake in the world. By Stanley Falls, exactly on the Equator, the river descends from the plateau into the Congo Basin, once occupied by a great lake. Through it, for a distance of close on 1000 miles, the Congo flows in an enormous bend, receiving a number of feeders, for the region is one of very heavy rainfall. The chief of these feeders is the Ubangi on the right bank and the Kasai on the left. At Stanley Pool the Congo gets over the western rim of the basin in a series of rapids. Up to this point the river is navigable from its estuary. Within the basin the Congo and most of the main tributaries are navigable. Railways have been built to circumvent the Falls at the two rims of the basin. The Congo is said to have the second largest drainage area in the world. Some idea of its great size may be got from these two facts: the British Isles could go into it eight times, and it could include France, Spain, and Germany, Italy, Austria, and Hungary. The volume of water is larger than that of any other African river.

(c) **The Niger.**—The Niger, under the name of the Joliba, rises on the northern slope of the Kong Plateau only 150 miles from the coast. Before it enters the Gulf of Guinea, however, it covers a distance of 2600 miles.

Note the great semicircular bend which the river takes to the north through the French Sudan. It rises in a rainy region, it passes through a rainless region, and it finally returns to a rainy region. Breaking through between the Kong Plateau and the Asben Plateau, the Niger descends to the coastal plain. Just as in the case of the Nile and Congo, rapids hinder navigation. Before entering the lowlands the Niger receives the Benue on the left bank. This feeder has a length of 850 miles. Both Niger and Benue are navigable in their lower courses. The Gulf of Guinea is entered by a swampy delta.

(d) **The Zambesi.**—Most of its head-streams take their rise near the north-west edge of the southern tableland. The northern slope of this edge is drained by the head-streams of the Kasai. Indeed it is said that in the wet season the watershed is difficult to define. As far as the Victoria Falls the course of the main river is southwards. The Falls, probably the finest in the world, are more than twice the height of the Niagara Falls. They occur where the Zambesi descends over the eastern edge of the tableland. Below the Falls the river flows in a great gorge ere it reaches the marginal lowlands proper. On the left bank it receives the Shiré, which drains Lake Nyasa. The Zambesi enters the Indian Ocean by a delta after a course of about 2000 miles.

CHAPTER VIII

AFRICA: CLIMATE AND VEGETATION

4. Climate.—As before, let us try to set out the physical factors likely to affect the climate of Africa. Follow the details on your map.

(a) Africa is crossed by the Equator and by both the Tropics. This means that the bulk of the continent lies within the Tropics. In this respect it differs entirely from Eurasia.

(b) It extends for equal distances north and south of the Equator.

(c) The northern portion is much wider than the southern.

(d) The northern portion adjoins the great land-mass of Eurasia. In fact, Arabia is a continuation of the Sahara. The tapering southern portion is bounded by two oceans.

(e) Practically the whole continent is a plateau whose edges approach near the coast.

(f) The South-eastern Plateau is in general much higher than the North-western.

(g) Africa is a very compact continent.

It should be easy now to state a few general climatic facts which result from these.

(1) We should expect to find more or less parallel belts of temperature and rainfall on each side of the Equator.

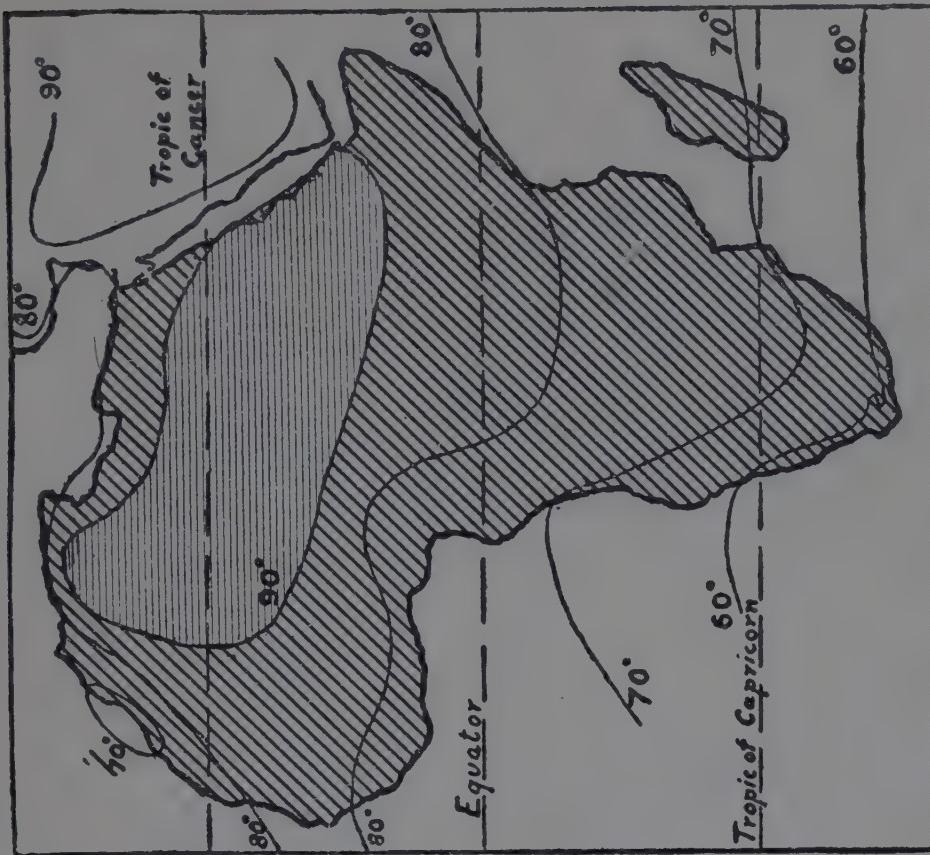


FIG. 19B.—Africa. July temperature in degrees Fahrenheit.

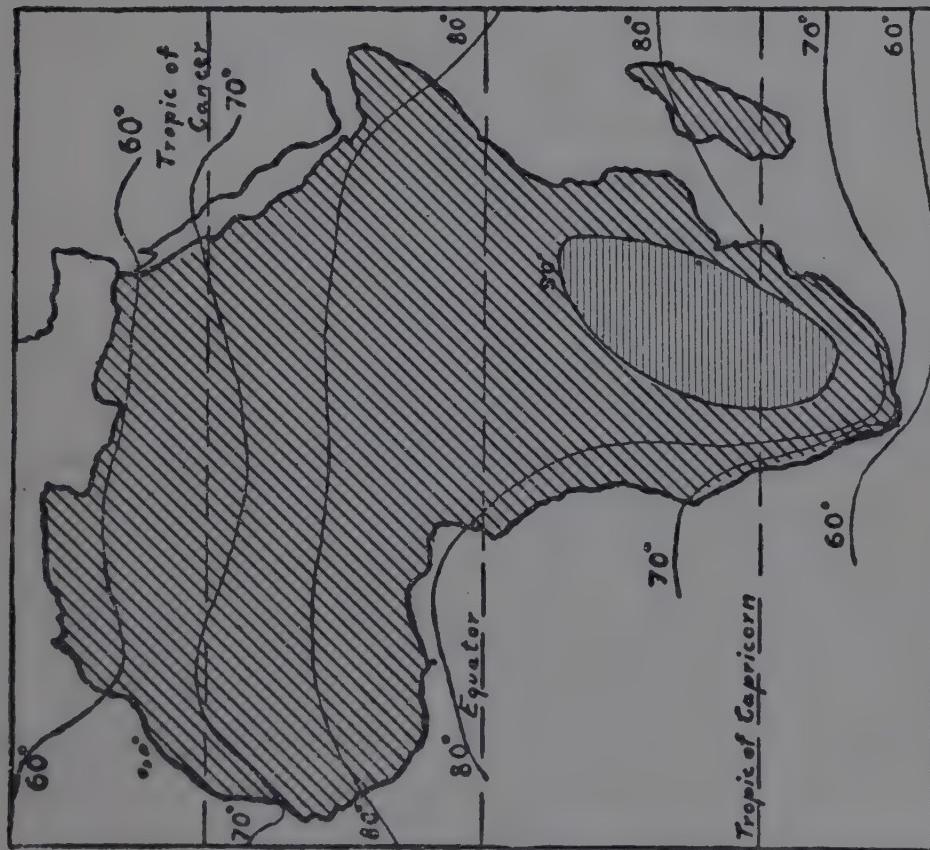


FIG. 19A.—Africa. January temperature in degrees Fahrenheit.

(2) These belts will be more extensive and probably more pronounced north of the Equator than south of it.

(3) The influence of the ocean will not be felt far inland.

(4) The great heat, a result of the latitude, will be somewhat moderated by the height. This will be especially true of the South-eastern Plateau.

(5) Since the Equator almost bisects the continent, it will be summer south of the line when it is winter north of it, and vice versa. (Do not read into the words "summer" and "winter" the same meanings they would have in a cool temperate region.)

The next step in our study of the climate of Africa is to examine the usual maps and see what light they give us.

(1) **Temperature.**—Since about three-fourths of Africa lies within the Tropics, the temperature, except in the most mountainous areas, will always be high. Indeed Africa is the hottest of all the continents. Again, note from the isotherm maps the two regions of very great heat, *i.e.* over 90° F. In July one of these lies north of the Equator, in January the other is south of the line. Further, you will see that these are not actually at the Equator as you might expect, but at the two Tropics.

On the January map the area over 90° F. extends from the Equatorial Plateau to the Drakensbergs. In other words, almost the whole of the South-eastern Plateau has a very high summer temperature. The 60° F. line barely touches the extreme south of the continent. Note how the isotherms south of the Equator are affected by the sea, especially by a cool current which runs parallel to the south-west coast. In the great land-mass to the north of the Equator the ocean has little or no effect, and the isotherms are practically parallel to the line itself.

For the northern summer the region over 90° F. covers most of the Sahara and the Sudan. The 80° F. line has shifted from the latitude of the Middle Niger and Abyssinia to the extreme north-west of the continent, while the 80° F. line from the south of the Equator has moved to the north of it. No part north of the Equator falls below 60° F.; to the south the same temperature is now found in the south-west corner. It is most interesting to note how the temperature belts migrate with the sun. No continent gives a better opportunity of seeing so clearly the seasonal swing north and south. Even if this were all you gathered from your study of the maps, you have learnt a great deal.

It would be worth your while to compare the temperature maps of Africa and Europe. Look on both for the 60° F. and the 70° F. isotherms. Is the former on the Europe map at all for the month of January? How far north is it for July? Compare the extent of Europe under 70° F. for July with the amount in South Africa under the same temperature for January and in North Africa for July.

(2) **Rainfall.**—We have laid emphasis on the fact that the temperature belts of Africa swing north and south with the sun. The same is true for rainfall. In January the regions of heaviest rains are south of the Equator. For that month the very wet area includes the Upper Congo and Zambesi Basins and the districts containing Lakes Tanganyika and Nyasa. The whole of Africa north of the latitude of the Gulf of Guinea coast, with the exception of the Atlas area, has very little rainfall or no rainfall at all. The south-west coastal region is also practically rainless.

As the sun advances northwards the rainfall belts

AFRICA

follow. For July the heavy rainfall belt is now north of the Equator. The wettest portions are the Upper Sudan, the Kameruns, and the Kong Plateau.

The diagram below will help you to get a clear idea of the seasonal swing of the rainfall belts. Blocks (*a*) and (*b*)

	(<i>a</i>)	(<i>b</i>)	Regions.	No.
	Northern Summer (July).	Northern Winter (January).		
T. of Cancer		M	Atlas—dry summer, wet winter. Sahara—dry at all seasons.	1 2
Equator	W	W'	Niger in Sudan—very wet in summer, very little rain in winter. Congo—very heavy rain at all seasons. Rhodesia—as for 3.	3 4 5
T. of Capricorn			Kalahari—as for 2.	6
	M'		S.W. Cape of Good Hope—as for 1.	7
	Southern Winter (July).	Southern Summer (January)	Regions.	No.
	(<i>a</i>)	(<i>b</i>)		

represent a strip or section of Africa from north to south under winter and summer rainfall conditions. In (*a*), for the northern hemisphere's summer, the bulk of the very wet region (W) is north of the Equator, and the Mediterranean region of winter (July) rains (M') has touched South Africa. In (*b*), for the northern hemisphere's

winter, the bulk of the very wet region (W') is south of the Equator, and the Mediterranean region of winter (January) rains (M) touches North Africa. On the right of the diagram you will see how it may be interpreted.

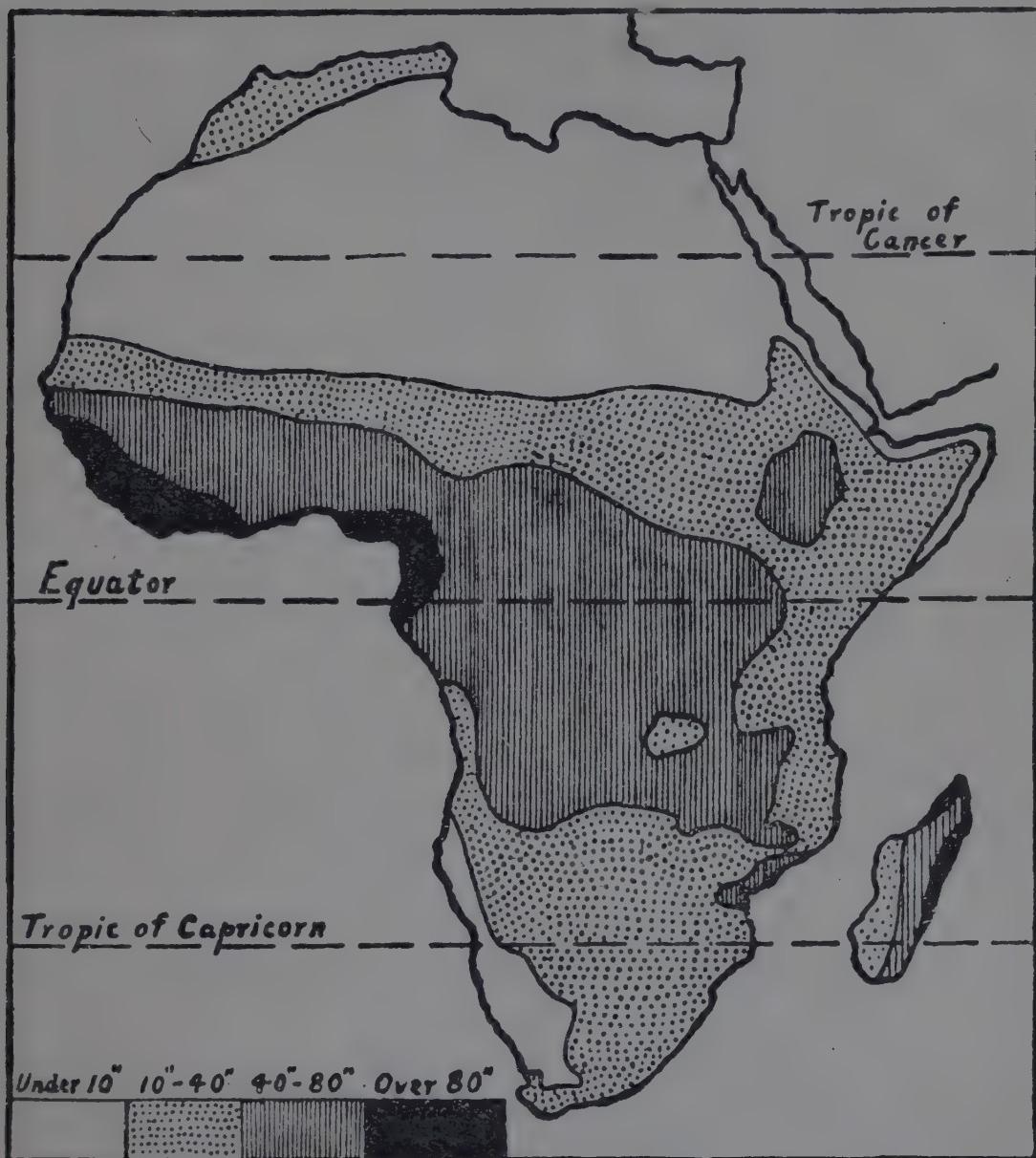


FIG. 20.—Africa. Mean annual rainfall.

With this diagram before you, the mean annual rainfall map should present no difficulty. In the Guinea lands, Nigeria, the Kamerun district, and the Congo Basin, the rainfall is over 40 inches. For several places within

the area thus included the amount is double this. On each side of the zone of very heavy rainfall there is a distinct grading off, till in the Sahara and Kalahari Deserts we meet with areas which are practically rainless. In the extreme north-west and south-west the rainfall is not heavy and occurs, as we have seen, only in winter.

Two points are important. The Guinea lands get a heavier rainfall than they otherwise might get because the winds there blow off the ocean for a great part of the year. These moisture-laden winds strike the Kong Plateau and a very heavy rainfall is the result. Then, right along the east and south-east coast we find a fairly heavy rainfall. This may be put otherwise—the parallel belts are not so pronounced to the south of the Equator as to the north of it. For instance, the Kalahari Desert does not extend right across the continent as the Sahara does. This is due to the fact that the Southern Plateau is higher than the northern, and that the south-east trade winds with their moisture blow in from the Indian Ocean.

The last step is to see whether we can clinch our argument from actual figures.

(a) To show the mean temperature in the Mediterranean region (Atlas area and Cape of Good Hope). Note that the summers are warm and the winters mild. The two towns given will, of course, have reversed seasons. (Degrees Fahr.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Algiers, lat. 37° N. .	53	55	58	61	66	71	79	78	72	61	52	44
Cape Town, lat. 34° S.	69	70	68	63	59	55	55	56	57	61	64	67

(b) To show that the rainfall of the Mediterranean

region comes mainly in winter. Again remember the reversed seasons. (Inches.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Algiers	4·2	3·5	3·5	2·3	1·3	0·6	0·1	0·3	1·1	3·1	4·5	5·4
Cape Town	0·7	0·6	0·9	1·8	3·9	4·4	3·5	3·3	2·2	1·6	1·1	0·8

(c) To show the slight seasonal change in temperature at the Equator. (Degrees Fahr.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
New Antwerp (Belgian Congo)	79	80	79	78	79	78	76	76	77	77	80	78

(d) To show that the Equatorial region is one of heavy rains at all seasons. (Inches.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
New Antwerp	4·1	3·5	4·1	5·6	6·2	6·1	6·3	6·3	6·3	6·6	2·6	9·3

(e) To show the very slight rainfall in the north and south desert areas. (Inches.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Timbuktu	0	0	0·1	0	0·3	0·9	3·5	2·8	1·1	0·4	0	0
Swakopmund	0	0·1	0·2	0	0	0	0	0	0	0·1	0	0·2

(The latter is a better representative; it is nearer the actual desert than the former.)

5. Vegetation and Animals.—It would be well, ere we begin a general description, to select from the section on climate those factors most likely to affect vegetation. As we have said in the case of both Europe and Asia, the presence or absence of rain is really the main factor. Now we noted in Africa how the rainfall belts seemed almost to be balanced on each side of the Equator. We

expect to find such symmetry also in the case of vegetation. Again, we have more than once noted that the rainfall belts to the north of the Equator have a wider extent than those to the south of it. This also will be reflected



FIG. 21.—Africa. Vegetation zones.

in vegetation. And, thirdly, we referred to the fact that the heavy rains of the Equatorial zone were found right along the east coast. This, too, will affect vegetation. Indeed, you could not do better than compare very closely

the maps showing mean annual rainfall and vegetation. What we have to say here is just our comparative reading of these maps.

(a) **The Equatorial Forest Zone.**—This includes the Guinea lands, the Kamerun area, and the Congo Basin. Here we have a very high temperature and a very heavy rainfall practically all the year round. The vegetation is, as a result, luxuriant. Huge trees and great creepers make the wet forests almost impenetrable. The forms of plant-life are exceedingly varied, and each plant is striving for a share of the sunlight which filters through the thick foliage of the tall trees. As yet little is known of the resources of the jungle. In some parts, particularly Guinea, mahogany and ebony are found, while palm oil and rubber form articles of export. The type of vegetation is reflected in the type of animals. These must be such as can live in the rivers like the hippopotamus, as can force their way through the dense undergrowth like the elephant, as can worm their way through like the snake, as can live in the trees like the monkey, and as can fly like birds and insects.

(b) **The Parklands.**—These encircle the steamy forests from the Upper Niger right round to Rhodesia and Angola. In the east and south, for the reason already mentioned, they are much more extensive than on the north. Throughout the region the rainfall is not quite so heavy as in (a). The seasons, too, are more pronounced—there is a wet and a dry season. The vegetation is therefore not so luxuriant, and woods are interspersed with grasslands. For this type of vegetation the usual name is savanna, but the term parkland has often been given to it because it is said to resemble the parks of England. The

trees are not continuous, but grow in great clumps, set in grassy stretches. By far the commonest tree is the massive baobab. Palms are also very common. Just as in the case of the selva (wet forests), the animals are characteristic. Since grazing animals abound, flesh-eating animals like the lion, leopard, hyena, and jackal are also numerous. The elephant is found on the forest margins. The giraffe, owing to its height, can crop the tender green shoots of the trees. The savanna is the real Africa. It is the home of millions of natives who raise great numbers of cattle and grow crops of wheat, maize, and millet. Ground nuts, better known as monkey nuts, are exported.

(c) **The Hot Deserts.**—Between these and the savanna there is a transition zone. Where the parkland grades off into the desert we have the scrubland—here sandy wastes alternate with tufts of coarse grass and prickly shrubs. The typical hot deserts are the Sahara and the Kalahari. We need say very little about these. Only in the oases is much life possible. Round these oases villages arise, the date palm is grown, and wheat can be cultivated. Otherwise the areas are barren, sandy, and rocky wastes, intensely hot by day and cool at night. Without the camel it would be almost impossible to cross the arid expanses.

(d) **The Mediterranean Zones.**—These, as we have seen, include not only the Atlas area but most of the Cape of Good Hope. Climatic features are a mild wet winter and a warm dry summer. The products are the same as those already mentioned for Mediterranean Europe. We ought specially to note the beautiful heaths of the Cape district. The same area has large ostrich farms.

We give below a list of some of the main plant productions of Africa. Only the chief regions for each are added.

Product.	Region.
Apples, pears, plums .	The higher districts of South Africa.
Cedar	West Africa.
Cloves	Zanzibar.
Cocoa	Equatorial West Africa. ¹
Coconut fibre . . .	"
Cotton	Egypt, Sudan, Uganda, Nigeria.
Dates	North Africa.
Esparto (alfa grass) .	Algeria and Tunisia.
Fats and oils from nuts	Equatorial West Africa.
Grapes	Cape of Good Hope and Madeira Is.
Gum arabic (acacia) .	Sudan (chief source of world's supply).
Lemon	Mediterranean regions.
Maize	South-east Africa.
Millet	Uganda, Sudan, Egypt.
Oranges	Mediterranean regions.
Rice	Madagascar, Lower Egypt.
Rubber	Equatorial West Africa and the Congo Basin.
Tobacco	Rhodesia, South Africa.
Wheat	Mediterranean regions.

¹ Gold Coast Colony produces more than half the world's output of cocoa.

CHAPTER IX

AFRICA: INDUSTRY AND COMMERCE

6. Minerals, Trade, and Commerce.—In the case of Africa we are not dealing with a continent like Europe, where the different countries have more fully developed their resources and where trade has been carried on for many centuries. Nor are there in Africa, apart from Egypt, lands like India, China, Japan, and Syria. Large parts of Africa are still very little known. The chief difficulty is the unhealthy climate, especially in the Equatorial zone. Where the climate does enable the white man to work, the natural wealth, whether plant, animal, or mineral, is gradually being developed. From the section on vegetation and from the paragraphs given below on minerals you will gather a good deal about the trade and commerce of Africa. From the British countries the chief exports are wool and diamonds (Union of South Africa), gold (Union of South Africa and Rhodesia), cotton (Sudan), cocoa (Gold Coast), and sugar (Mauritius). To these the mother country sends manufactured goods, especially textiles. From the French countries, which next to the British are most fully developed, the main exports are palm products, fruit, and rubber (French West Africa), wines (Algeria), cereals (Tunisia), and ivory (Somaliland).

The list which follows is not meant to be memorised; it is intended to help you to realise what are the main African

exports. The figures represent the values for a recent year in millions of pounds sterling.

Cotton, 43; gold, 36; wheat, 20; wine, 19; wool, 11; palm products, 8; sugar, 7; cocoa, 6; diamonds, 5; tobacco, 3.

Africa is fairly rich in minerals. The Mediterranean lands have supplies of iron ore, lead, zinc, mercury, copper, and phosphates of lime. These are not worked to anything like the extent they might be. Morocco is particularly backward. Nigeria produces coal, lead, iron, and tin. Tin ore was exported to the value of £2,287,000 in 1927. The Gold Coast Colony sent out gold worth £727,000 in 1927, and manganese worth £683,000. Within the Katanga district of the Belgian Congo we have one of the richest copper mines of the world. Gold is found in large quantities round Salisbury and in Southern Rhodesia. In the ridge between the Orange and the Limpopo Rivers is a great vein of gold. This is worked especially round Johannesburg in the Transvaal. The area possesses the richest gold mines in the world, and the output for one year has reached the enormous total of £45,000,000. We next reach Kimberley, where are located the famous De Beers diamond mines. The Cape Province has valuable seams of coal, especially at Middelburg. Natal is rich in minerals, and large coal mines are working round Newcastle and Dundee. Durban is rapidly coming to the front as a coaling station. On the west the copper from the valuable Ookiep mines is exported from Port Nolloth.

7. Railway Communication.—As you might expect, Africa is not covered by a network of railways. Indeed,

for the great size of the continent the routes are few. Not till 1859 was there any railway line laid at all. But gradually threads of communication are being run from coast to interior to tap the natural resources. You will remember the general build of Africa—it is a great plateau, and several of the rivers descend to the marginal lowlands by falls and rapids. They are not like the Rhine and the Danube, the Ganges and the Yang-tse-Kiang, waterways leading far inland. Many of the African railways have been built to avoid the difficulties. Again, enormous tracts in Africa are deserts, where railways are of no avail. 16003

The Mediterranean lands or Barbary States—Morocco, Algeria, Tunisia, and Libya—are fairly well supplied with railways. The main line runs through the Tell district parallel to the coast from Morocco and Algiers to Tunis and Sfax. Branches strike to the ports and across the Atlas to the desert, where caravan routes leave for the south.

Within the Guinea lands several railway lines have been constructed to link coast and interior. They are of great service in bringing down the mineral and vegetable products of an extensive hinterland to such ports as Harcourt, Lagos, Freetown, and Dakar.

The Belgian Congo has five railway sections. The first of these runs from Matadi, the port at the mouth of the river, to Leopoldville, the capital, and was built to overcome the transport difficulty of the rapids. The second, from Stanleyville to Ponthierville, avoids the great falls. The third links two places in the upper reaches of the river. The fourth connects Lake Tanganyika and the river, while the fifth taps the Katanga copper district in the south-east. At present Stanleyville, almost on the equator, is the limit of the Cape to Cairo Railway.

Following the coast and holding to our plan of noting how the railroads are pushing their way into the interior, we come to Angola. From Loanda and Benguella, the two ports, lines run towards the heart of the continent. One of these is projected to continue as far as Chilongo, and so to be connected with the Cape to Cairo Railway.

In South-west Africa we have again two lines. Their termini are linked by a long cross-country route from De Aar junction, in Cape Province.

Within the Union of South Africa most of the main towns are in railway communication. To begin with, the Union section of the Cape to Cairo Railway runs from Cape Town north through Worcester, De Aar, Kimberley, Vryburg, and Mafeking. Thereafter it is continued into Rhodesia, passing through Bulawayo, the Wankie coal-fields, Livingstone at the Victoria Falls, and Broken Hill with its lead and zinc mines. A branch line runs through Salisbury to Beira. In the Cape Province two lines from Port Elizabeth and East London climb the terraces to the High Veld, unite, and continue a course parallel to the Cape Railway through Bloemfontein and Pretoria. From this line branches run to the coast at Lourenço Marques and Durban, while several cross-country links join up the two main routes.

Apart from the branch lines to Lourenço Marques and Beira, three short routes in East Africa require mention. The first is a line from Kigoma on Lake Tanganyika to Dar-es-Salaam, the second a route from Kisumu on Lake Victoria to Mombasa, and the third a link between Addis Ababa, the capital of Abyssinia, and the port of Jibuti in French Somaliland.

Last in our survey comes the northern section of the

Cape to Cairo Railway. We have seen that the southern section has linked Cape Town to Stanleyville in distant Belgian Congo. How far has the great transcontinental line gone southwards to meet its fellow? The starting point is Cairo, though continuations run to Alexandria and Ismailia. As far south as Aswan the railway keeps closely to the river, throwing off two branches to the oases towns of Fayum and Kharga. Between Aswan and Wady Halfa there is a break. At Halfa the railway resumes, and, leaving the river, avoids the great bend and three cataracts, and strikes for Berber. Here is a line which goes east to Port Sudan and Suakin on the Red Sea. The main line follows the Nile to Khartum and then the Blue Nile to Sennar. From this point another eastern branch goes off to Gedaref, Kassala, and Port Sudan. A westerly line crosses the White Nile and proceeds to El Obeid, which is the present limit from the north.

EXERCISES

1. Using the scale in your atlas map, measure the distance from Cape Blanco to Cape Agulhas and from Cape Verde to Ras Hafun (south of Cape Guardafui).
2. Make a list of the islands and island groups round the coast of the continent.
3. Name the openings (bays, gulfs, and seas).
4. Give the names of at least ten capes.
5. Make a diagram-section across Africa along the Equator.
6. South Africa descends to sea level in three steps or terraces—the High Veld, the Great Karroo, and the Little Karroo; the edges of the steps are mountain ranges—the Nieuwveld, the Zwarteborgen, and the Langebergen. Make a cross-section from north to south.
7. Name the deserts of the world on the same latitude as the Sahara and the Kalahari.

8. Below are given for the continent the percentages of land under 600 feet. Show these by a diagram.
Europe, 65; South America, 43; North America, 30;
Australia, 28; Asia, 25; Africa, 15.
9. Name the four drainage areas of Africa.
10. Here are some approximate river lengths in miles. Indicate the comparison by a diagram. Nile, 3700;
Congo, 3000; Niger, 2600; Zambesi, 2000; Orange,
1200; Limpopo, 1000.
11. Draw a straight line from Aswan to Freetown. Name the rivers, the basins, and the mountains crossed by it.
12. Make a full list of the African lakes.
13. With your physical map in front of you, answer very briefly these questions:
 - (1) Which of the rivers has no feeders for a considerable distance in its lower course?
 - (2) Which three great rivers have deltas?
 - (3) Can you explain from the physical map why the Niger makes such a remarkable bend in its course?
 - (4) What is the reason for the rapids and falls in the courses of the four chief rivers?
 - (5) Which river crosses the Equator twice? Which crosses 10° N. twice? Which is cut by the Tropic of Cancer? Which is cut by the Tropic of Capricorn?
14. Make diagrams and graphs from all the statistics given at the close of the section on climate. The construction of these is really the fifth step in the study.
15. Copy and colour the vegetation map.
16. From your map make as full a list as you can of the British and French possessions in Africa.
17. Make a diagram to show these figures:

Total area of Africa = $11\frac{1}{2}$ million sq. miles

Area of British Africa = 4 "

Area of French Africa = 5 "

18. Do the same for these population figures:

Africa's total population = 140 millions

British Africa's population = 50 "

French Africa's population = 33 "

19. In two columns set forth the names of the lands traversed and the places passed through by the Cape to Cairo Railway.

20. What are the distances from Southampton to Melbourne via Cape Town, and from Southampton to Melbourne via the Suez Canal?



CHAPTER X

AUSTRALASIA

1. General—Size and Extent.—By Australasia we mean Australia, Tasmania, New Zealand, New Guinea, and a great number of small islands which go under the name of Polynesia. Sometimes the term Oceania is applied to the whole multitude of island groups, islands, and islets of the Southern Pacific. The term is quite a good one and is now often used. Under New Guinea are included Dutch New Guinea, British New Guinea (governed by the Australian Commonwealth), and the former German New Guinea (also at present ruled by the Commonwealth). We shall not describe the whole of Australasia; it will be sufficient for our purpose to keep to the great island continent of Australia (with Tasmania) and to New Zealand.

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In the general section on Asia, read what it says about the boundary between Australia and that continent. We know that at one time Australia was attached to Asia and that the seas on the north of the island are not deep. The East Indies may be regarded as stepping-stones or links between the two continents. Australia is bounded on the north and west by the Indian Ocean, on the east by the Pacific, on the south by the Southern Ocean—a great expanse where the waters of three oceans meet and

mingle—and on the north by the many arms of the Pacific, separating the islands which stretch from the Malacca Strait to South Cape in New Guinea. The chief of these arms concerning us is the Torres Strait between New Guinea and Cape York Peninsula.

Australia is the smallest of the continents. It is the only one entirely in the Southern Hemisphere. Indeed, the word "austral" means south. The island is about four-fifths the size of Europe, and is practically equal in area to the United States. New Guinea is about one-tenth the size of Australia, Tasmania is less than one-tenth the size of New Guinea, and New Zealand is four times the size of Tasmania.

The coast-line is 12,000 miles in length. That is not long for its size. Compare it with Africa and South America and contrast it with Europe. The only really large opening in the coast is the Gulf of Carpentaria, deeply set between the peninsula of Cape York and Arnhem Land. On the south the Great Australian Bight does not, in comparison with its width, make a deep entry into the land.

The parallel of 10° south runs across Torres Strait and the parallel of 40° south across Bass Strait. The island is almost bisected by the Tropic of Capricorn. Note that Australia is there at its widest. Refer to the map of Africa and see where the same line cuts that continent.

2. Relief.—The general build of Australia is fairly easy to describe. All geographers are now agreed on the three main divisions of the relief: (1) East Australian Highlands, (2) Central Plains, and (3) Western Plateau. Following our usual plan we shall briefly describe these.

(1) Eastern Highlands.—These run parallel to the

east coast and extend from Cape York almost to the mouth of the Murray. They are often grouped under the one name of Great Dividing Range, because they act as a watershed and because they cut off the coast and the



FIG. 22.—The Build of Australia.

Key.—I, Ashburton Plateau. II, Kimberley Plateau. III, Arnhem Land Plateau. IV, Queensland Range. V, New England Range. VI, Liverpool Range. VII, Blue Mountains. VIII, Australian Alps. IX, Grampians. X, Mount Lofty Range. XI, Flinders Range. XII, Gawler Range. XIII, Stuart Range. XIV, Grey Range. XV, Macdonnell Range. XVI, Musgrave Mountains. XVII, Stirling Range. XVIII, Darling Range. XIX, Great Sandy Desert. XX, Great Victoria Desert.

narrow marginal lowlands from the plains of the interior. They are really like the edge of the African Plateau as it is seen especially in South-east Africa. Since, in the study

of Africa, we referred particularly to the Drakensbergs, the Great Dividing Range may be taken as the Australian counterpart. The seaward slope is steep; the landward slope is long and gentle. As the whole range cannot be seen from the ocean at one time, different names have been given to it at different places along the coast. For instance, we have the New England Range, the Liverpool Range, the Blue Mountains, the Australian Alps, and the Grampians. The highest peak is found in the Alps, and reaches an altitude of 7350 feet. Tasmania is a continuation, now detached, of the Eastern Highlands. Bass Strait is very shallow.

(2) **Central Lowlands.**—The name is not particularly good. In the first place, they might be better termed the East Central Lowlands, for they lie wholly east of the 135° line of longitude which almost bisects the east-west extent of the continent. Again, they are not all lowlands. Within the division we can distinguish five separate portions: (a) the basin of the Darling and Murray Rivers; (b) the Lake Eyre Basin, with the smaller Lakes Gairdner and Torrens Basin, an area of inland drainage; (c) the ridge, which, under the different names of the Grey, Flinders, and Lofty Ranges, separates the river basin and the lake basin; (d) the Gulf of Carpentaria lowland; and (e) the broad low ridge which divides (d) from (b). Long ago, when the Eastern Highlands were very much higher than they are at present, most of the Central Lowlands was under the waters of a sea. Into this ran short, swift rivers from the Highlands, carrying with them large quantities of silt. Later, when the bed of this sea rose to become dry land, it formed a plain covered with river-deposits of sands and clays.

(3) **Western Plateau.**—This lies west of the 135° east longitude line and occupies more than half the whole surface of Australia. Here and there within the vast tableland hills rise above the general level. A well-known Australian geographer calls them “bulges on the surface of the plateau rather than true mountain ranges.” These hills and the edges of the plateau itself are given various names. The most prominent heights are the following: the Stuart Range on the eastern edge of the plateau overlooking the Lake Eyre Basin; the Gawler Range occupying a similar position in respect of the Lakes Gairdner and Torrens Basin; the Macdonnell and Musgrave Ranges in the heart of the tableland; the Stirling Range on the southwest edge; the Darling Range on the western edge; several ranges which may be taken under the name of the Ashburton Range; the Kimberley Plateau north of the Fitzroy River; and the Plateau of Arnhem Land. Two portions of the tableland are almost desert—the so-called Great Sandy Desert and the Great Victoria Desert.

3. Rivers.—The first point to note about the drainage of Australia is the great size of the inland drainage area. It has been calculated that about one-half of the total surface of Australia comes under this area. We could not say this of any other continent. The only river system of first-rate importance is that of the Murray-Darling. Both of these rise in the Eastern Highlands. During the rainy season they come down in flood and deposit large quantities of alluvium over their lower valleys. During the dry season they almost disappear. Note on your map the numerous tributaries of the Darling especially. If we were to take the Condamine, the head-stream of the Culgoa

feeder of the Darling, as the head-stream also of the main river, the total length is about 3000 miles. On the east coast, since the mountains rise abruptly from the sea, the rivers though numerous are short and rapid. The Flinders is the chief river entering the Gulf of Carpentaria. Into the inland sea of Lake Eyre there flow several streams, particularly the Diamantina and Cooper's Creek. These are rivers only in the rainy season. When it gives way to the dry season, the rivers practically vanish and the shallow salt lake itself shrinks in size. At one time Lake Eyre was a freshwater lake, drained south to Spencer Gulf.

We must not omit to mention the Artesian Basins and the Irrigation Areas. In a land like Australia the supply of water is a vital matter. As in Africa and India, within many of the river basins, but especially in New South Wales and Victoria, dams or barrages have been built. By means of artificial channels the river waters, stored up behind the dams during the rainy season, are turned on land which could not otherwise be made productive. Many irrigation schemes are in progress throughout Australia. Of the Artesian Basins there are in all seven. The largest, known as the Great Australian Basin, stretches from the shores of the Gulf of Carpentaria to the Darling River, and from the Eastern Highlands to Lake Eyre. The greater part of Queensland and the northern portion of New South Wales are thus included. In these basins river water is not employed. The method in this case is to tap underground sources. Already thousands of bores have been sunk.¹

¹ See *The British Empire* in this series, chap. viii, pp. 54-56.

CHAPTER XI

AUSTRALIA: CLIMATE AND VEGETATION

4. Climate.—As Australia corresponds in many respects to Africa, we shall, in studying the climate of the former, adopt almost the same plan as we adopted in the case of the latter.

The map of the island-continent and the note on the relief should help us to state the chief factors likely to affect the climate.

(1) Australia's world position. As we have already noted, the continent lies entirely in the Southern Hemisphere. Its farthest north point is about 10° south latitude, and its farthest south point about 40° south latitude, while the Tropic of Capricorn almost bisects the island at its widest. Remember that 40° is the latitude of Sardinia. Clearly nowhere save in the uplands will Australia ever be cold. Now look for the Tropics on maps of other continents. In South Africa the Tropic of Capricorn crosses the Kalahari Desert; in North Africa the Tropic of Cancer crosses the Sahara. Take Asia—the Tropic of Cancer crosses the Arabian and Thar Deserts. And when we come to study America, we shall find the same fact to be true. Evidently Australia lies on one of the world's dry belts.

(2) The latitude of the north and south. The north of the island corresponds in latitude with India. Just as India had a very rainy season when the south-west

monsoon prevailed, so we should expect North Australia also to have a very rainy season when the monsoon, now from the north-west, prevails. Again, since the southern parts of Australia lie in what we may call "Mediterranean" latitudes, we expect that these will get winter rains. Compare the Cape of Good Hope Province in Africa.

(3) Australia's relief. We found that the greater part of the continent was a plateau, that the highest land ran parallel to the east coast, and that between the Western Plateau and the Eastern Highlands lay a great basin. What follows? In the first place the highlands will prevent the influence of the sea from reaching the basin of the interior. In the second place the height of the highlands and of the plateau will somewhat, though not very much, moderate the heat. The Western Plateau is not high enough to bring much rainfall. In Africa the plateaux are generally much higher than any part of Australia. And, in the third place, since the Great Dividing Range runs right across the path of the trade winds, their rainfall will be deposited on the heights, and little will reach the interior.

(4) Australia is an island, but a very compact one. This means that, though it ought to be affected by the moderating influence of the sea, the lack of openings prevents this from being borne far inland as in the case of Europe. Remember, too, the build. Save in the Murray Basin and to the south of the Gulf of Carpentaria the high land comes close to the coast. On all counts, then, we expect the interior to be very hot and very dry.

Turn now to the usual climatic maps and see whether they bear out what we have found from our physical map study.

(1) **Temperature.**—In the January isotherm map (*i.e.*

the southern summer) the chief point to note is that the whole of the continent from about the Tropic northwards has a mean temperature of over 80° F. Within the area over 80° F. there is a large tract over 90° . This latter does not reach the coast, for the sea's influence, though not extending far inland, affects to some extent the regions near the coast. The 70° F. line just skirts the southern extremities of West Australia and Victoria. The 60° F. line does not touch the main island but cuts through Tasmania. As usual, look for the same isotherms in the continents already studied: (a) for the position of the 90° F. line in Africa south of the Equator in January and north of the Equator in July; (b) for the position of the 60° F. line barely touching the Cape of Good Hope Province; (c) for the area enclosed by the 90° F. July isotherm in Asia; and (d) for the position of the 70° F. line in the July map of Europe.

In July the sun is overhead to the north of the Equator, so that we expect less warm conditions to prevail in Australia. This month is Australia's coolest. The highest temperature is found of course in the north, where all the area nearer the Equator than the head of the Gulf of Carpentaria has a mean temperature of over 70° F. The 60° line has now reached the latitude of the Tropic of Capricorn. Again look for the same isotherms in Africa. Compare very carefully South Africa and Australia. They have many climatic points in common, just as they are rather similar in build.

The main points, then, to remember in connection with the temperature of Australia are these:

(a) for the winter months the northern half of the continent is hot, the southern half is cool;

AUSTRALIA

AUSTRALIA

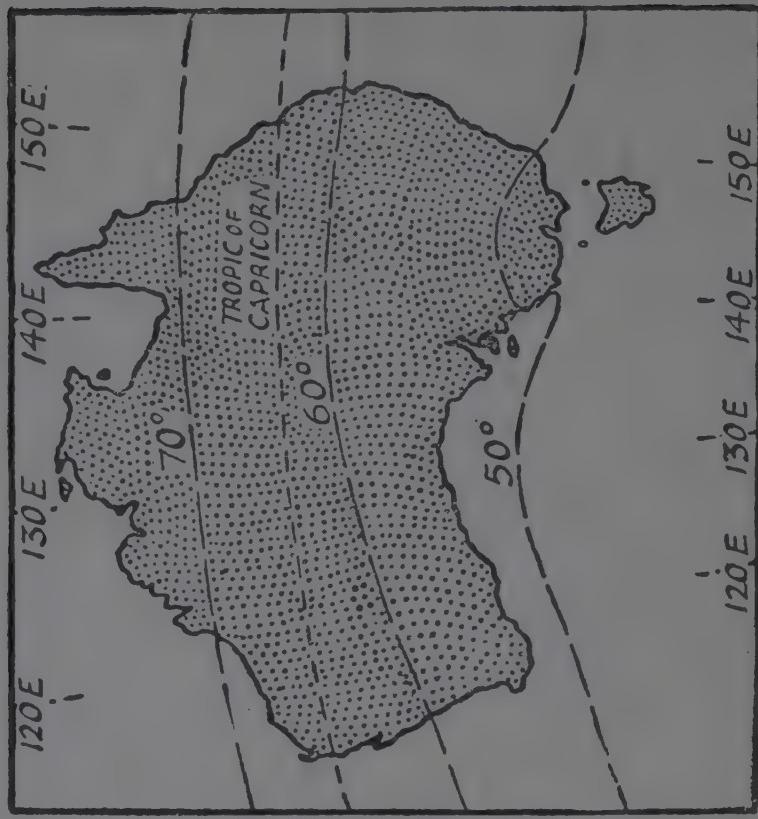
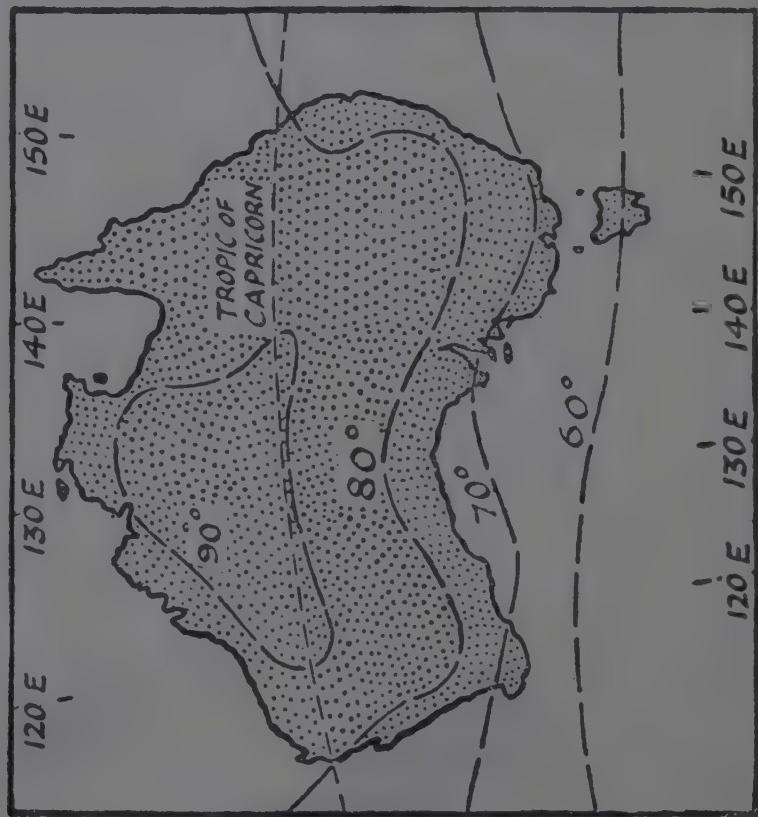


FIG 23.

January temperature in degrees Fahrenheit.

July temperature in degrees Fahrenheit.

(b) for the summer months Australia is in general hot, in a great part of the interior very hot.

These two general points will not refer to the Eastern Highlands, where the heat will be modified by height and by sea breezes.

(2) **Rainfall.**—Turn now to rainfall, a much more important matter. Closely examine the mean annual rainfall map. You will note that most of Arnhem Land and the northern section of Queensland have over 40 inches. Now this fairly heavy rainfall comes in summer, when the interior is an area of very high temperature and when winds blow in from the Indian Ocean bringing moisture with them. In fact the conditions which in India produced the south-west monsoon and the heavy rains are here repeated. Again, you will note that the belt of heavy rains extends far along the east coast. Why?—because we have the mountains here, and the trade winds are cooled in rising over these and hence deposit their moisture. Further, the extreme southern portions of West Australia and Victoria and the island of Tasmania have from 25 inches to 40 inches or more. The rains come in winter when the westerly winds have shifted north with the sun and now touch the south of Australia. Western Tasmania gets the heaviest of the rains because it stands full in the path of the winds. Lastly, you will note that the interior, to which the rain-bearing winds cannot penetrate, is very dry. Keep in mind then the four rainfall regions:

(a) the north, with very heavy summer rains;

(b) the east, with rain practically at all seasons, though the heavier fall comes in summer when the trade-wind belt has shifted southwards;

- (c) the south, with winter rains; and
- (d) the arid interior.

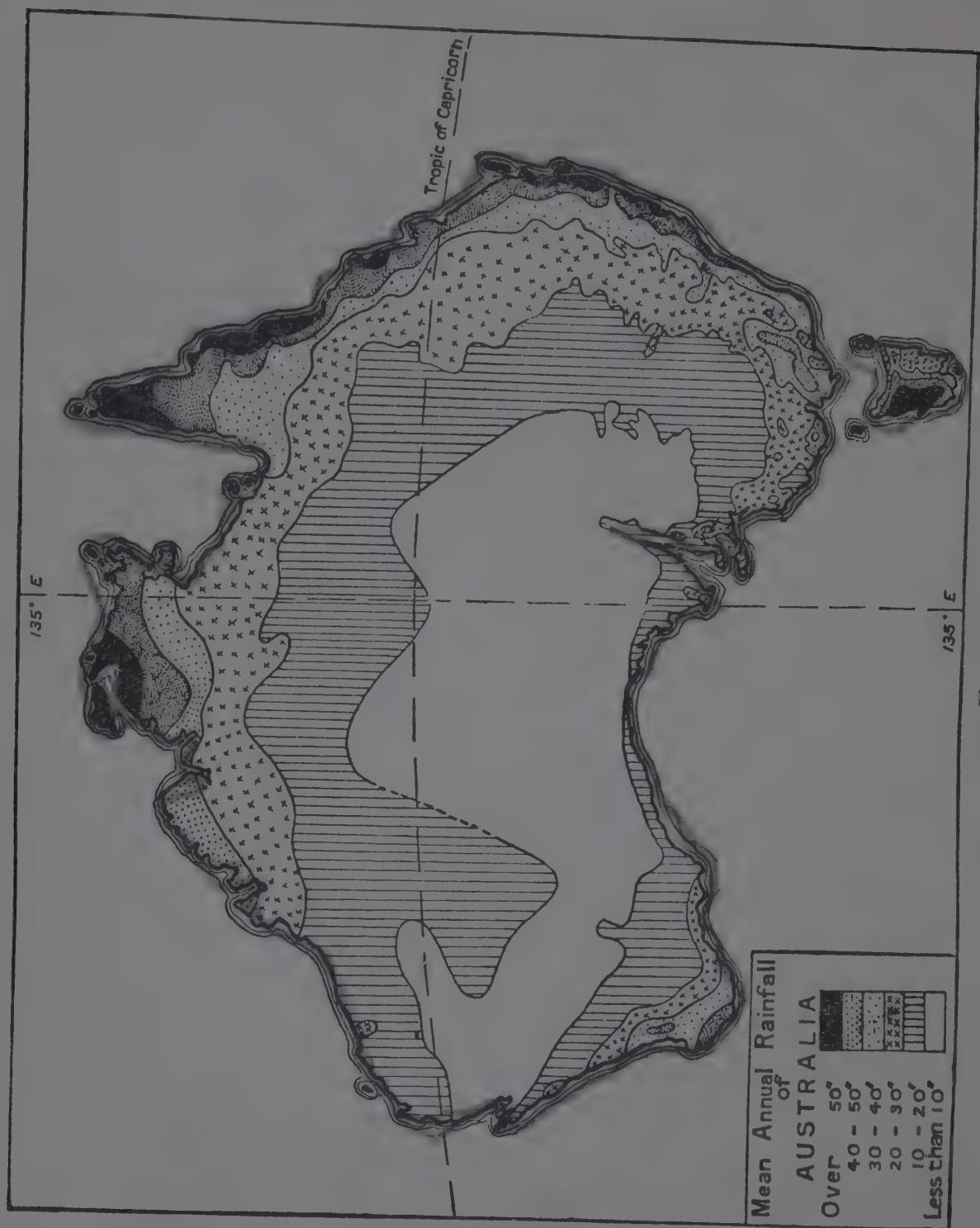


FIG. 24.

To impress these four regions in your memory, we give a few very instructive figures.

- (a) For Cape York the rainfall for the four summer

months (December, January, February, March) amounts to 67 inches, for the four winter months (June, July, August, September) it amounts to $1\frac{1}{2}$ inches.

For Darwin the same figures are 48 inches and 1 inch.

(b) For Brisbane the monthly rainfall figures are:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
6·7	6·7	6·1	3·7	3·0	2·6	2·3	2·4	2·1	2·7	3·7	5·1

For Sydney the figures are:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
3·7	4·7	5·1	5·2	4·9	5·2	4·7	3·3	2·9	2·8	2·9	2·6

(c) For Adelaide the rainfall for the winter months (June, July, August, September) amounts to 10 inches, for the summer months (December, January, February, March) it amounts to 3 inches.

For Albany the same figures are 19 inches and 4 inches.

(d) For William Creek (near Lake Eyre) the monthly rainfall figures are:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
0·5	0·4	0·8	0·4	0·4	0·7	0·3	0·3	0·4	0·3	0·4	0·3 (5·2)

5. Vegetation.—Perhaps the main thing we have learnt about the rainfall of Australia is that along the north, the east, the south-east, and the south-west coasts there is a fringing belt with rains at some time during the year. In our study of other continents we have seen that a close, indeed a very close, connection exists between rainfall and vegetation. And the same is true of Australia. The vegetation fringe corresponds to the rainfall fringe, and the interior is often scrubland and poor grassland.

Within the coastal fringe of vegetation, wide in some places and narrow in others, there are at least five sections,

where different rainfall conditions cause different types of vegetation. Let us take a very brief survey of the five.

(a) On the extreme north where, as we have seen, the heavy monsoon rains fall chiefly in the summer season, we find the hot wet forest, very similar in type to that met with in the Malay Archipelago, in parts of India, and in Equatorial East Africa. This belt is continued in a narrow strip as far south along the coast of Queensland as latitude 25° .

(b) Immediately to the south of the forests, and stretching right across the north of the continent almost to the 20° line of latitude, is the belt of savanna lands, where the growth is rather like what we have already described in Africa. A kind of baobab grows here also and great stretches of tall grasses are dotted over with groves and clumps of trees. As we go southwards towards the interior the trees disappear and grasslands prevail. These gradually give way to poor grassland and scrubland.

(c) On the south-east coast, and especially in New South Wales, we find the region of warm temperate forests. Here, although the rains are distributed over the year, the heavier fall occurs in summer. The woods are naturally not so dense as the forests mentioned under (a). Indeed large parts are grass-covered. Within the Murray-Darling Basin, beyond the Eastern Highlands, the grasslands are more or less continuous. This basin rather resembles the steppes of South-eastern Europe.

(d) On the extreme south, especially in Victoria, in the Adelaide area of South Australia, in the western portion of Tasmania, and in the Perth district of West Australia, we find the "Mediterranean" region. This, as we know, is one of summer drought and winter rains, and the

vegetation is in general similar to that found in Southern Europe. This is the real home of the eucalyptus tree, so typical of the Australian landscape, and of beautiful shrubs like the mimosa and the acacia. Two varieties of the big eucalyptus, the jarrah and the karri trees, yield very hard timber, that from the former being used in shipbuilding, that from the latter for wood-paving.

(e) Within the marginal fringe of vegetation lies the heart of Australia, occupying most of West and South Australia. It is a region with not more than 10 inches of rainfall, and may be described as poor grassland and scrubland.



CHAPTER XII

AUSTRALIA: INDUSTRY AND COMMERCE.

6. Occupations.—In the case of Australia we are not going to follow our usual rule of dealing with trade and commerce or with communication. Instead, we shall sum up all that seems necessary under the heading of Occupations. You will remember that Australia is a very young country, that it has not many manufactures, and that it has to depend on its imports for cotton and woollen goods and for machinery. But it has got the resources, and the Australians are an enterprising people. In a very few years it may be able to be self-sufficing, not only in food products but in manufactured goods.

The wool industry is by far the most important in Australia. Indeed it is the staple industry. For sheep-rearing a climate of a certain type is needed, and Australia over a great extent has that climate. In the first place, the average temperature must not be too high and the rainfall must neither be very light nor heavy. We are told that 75° F. is the temperature limit, and that for rainfall the very best areas have over 10 inches and under 20 inches. It will be clear to you, then, from what we have said in the section on climate, that the great arid interior, the hot, wet, northern region, the Eastern Highlands, and the western half of Tasmania will not be favourable for sheep-rearing. That this is the case is plainly shown from the figures

giving the number of sheep per square mile for the separate states. New South Wales has 150; Victoria, 140; Tasmania, 60; Queensland, 30; South Australia, 15; and West Australia, 10. In actual total numbers New South Wales had about one-half of Australia's enormous total of 99 millions in 1927-28. For the world Australia stands an easy first. The order of the other chief sheep-rearing countries in the year 1926 was as follows: U.S.A., 42 millions; Argentine, 36 millions; Union of South Africa, 35 millions; Great Britain, 25 millions; and New Zealand, 25 millions. Wool is by far the most important article of export. Out of a total export value of £139,000,000, wool accounted for £66,000,000. To Great Britain the Commonwealth sent wool to the value of about £19,000,000. To this we ought to add nearly £2,000,000 for mutton.

Since the grass covering which would be sufficient for sheep would not suffice for the rearing of cattle, we expect to find the latter occupation carried on in the wetter areas. Hence the east marginal lowlands and the foothills strip of the Eastern Highlands are the main regions for cattle-rearing and dairying. East Queensland is the chief district for the former and New South Wales that for the latter. Of recent years the export of butter has greatly increased; it is now sent abroad to the annual value of about £5,000,000.

Of cereal crops the chief is wheat. Within the last twenty years both the average and the yield of this grain have gone up by leaps and bounds. The chief wheat-producing states are Victoria, New South Wales, and South Australia. The best regions are a belt just to the leeward side of the Eastern Highlands, where the rain is

sufficient and yet not too heavy, and the Adelaide area. About 10 million acres are under cultivation. Next to wool, wheat is the most important article of export. It is sent out to the annual value of about £14,000,000.

South Australia is the chief vine-growing state. The vineyards are found especially round Adelaide. Wine is now an important article of export. In Queensland tropical fruits can be grown to perfection. As yet the fruit-growing area is small, but it is bound to increase enormously in the near future.¹

Australia is very rich in several metals. West Australia contains the famous gold mines of Kalgoorlie and Coolgardie, connected by rail with Perth and Albany. The precious metal is also mined round Ballarat and Bendigo in Victoria, and round Charters Towers and Mount Morgan in Queensland. It is exported to the annual value of £3,000,000. In New South Wales we find the noted silver mine of Broken Hill, linked by rail with Adelaide. The amount of silver is now much less than it formerly was, and, since zinc is associated with it at Broken Hill, as much of this is exported as of silver. Copper is obtained in the Cobar district of New South Wales and round Wallaroo in South Australia. Coal is likely to become an important article of export. At present New South Wales is the chief area, the main mines being near Newcastle and Sydney. Queensland has also valuable seams. Within the former coal area iron ore is also mined, especially at Lithgow and Newcastle.

7. The Commonwealth.—The table shows at a glance the states included in the Australian Common-

¹ See *The British Empire* in this series, chap. ix, p. 58.

wealth, with their capitals and the approximate populations of these.

State.	Capital.	Population of Capital.
New South Wales . . .	Sydney . . .	1,100,000
Victoria . . .	Melbourne . . .	945,000
Queensland . . .	Brisbane . . .	260,000
South Australia . . .	Adelaide . . .	327,000
West Australia . . .	Perth . . .	191,000
Tasmania . . .	Hobart . . .	55,000

The capital of the Commonwealth is at Canberra, where a small area is reserved and is entitled the Federal Capital Territory. The Northern Territory of South Australia passed from the control of the latter state to that of the Commonwealth in 1911, and on 1st March 1927 the Northern Territory was divided along 20° south latitude line into two territories called North Australia and Central Australia respectively.

Of the component states, Victoria, the smallest, is the most densely peopled. The total population of the Commonwealth is about $5\frac{3}{4}$ millions, and the total area is close on 3,000,000 square miles. This works out at rather fewer than two persons to the square mile.



CHAPTER XIII

NEW ZEALAND

The New Zealand group of islands lies to the south-east of Australia, from which it is separated by about 1000 miles of ocean. We shall not be far wrong if we say that New Zealand occupies much the same latitude position in the Southern Hemisphere as Italy does in the Northern. And it is not unlike the shape inverted of the same country. As far as regards longitude there is a big difference, for the longitude of East Cape (North Island) is almost 180° —practically half-way round the globe from the 0° of Greenwich. The total area of the whole group, inclusive of several tiny groups in the Pacific Ocean, is about 104,000 square miles.

On an atlas map look for North Island, South Island, and Stewart Island; for North Cape, South Cape, West Cape, East Cape, Cape Egmont, Cape Palliser, Cape Farewell, and Banks Peninsula; for Cook Strait and Foveaux Strait; for Hauraki Gulf, Bay of Plenty, Hawke Bay, and Canterbury Bight. It would be well at the same time to make a list of the rivers. Most of them are short and rapid. The Waikato is the chief river of North Island and the Clutha of South Island.

From West Cape to East Cape there stretches a backbone of mountains, somewhat like the Apennines of Italy. This backbone keeps to the west in South Island and to the east in North Island. In the former the name Southern

Alps is given to the main part of the ridge. Here Mount Cook reaches a height of 12,349 feet. In North Island

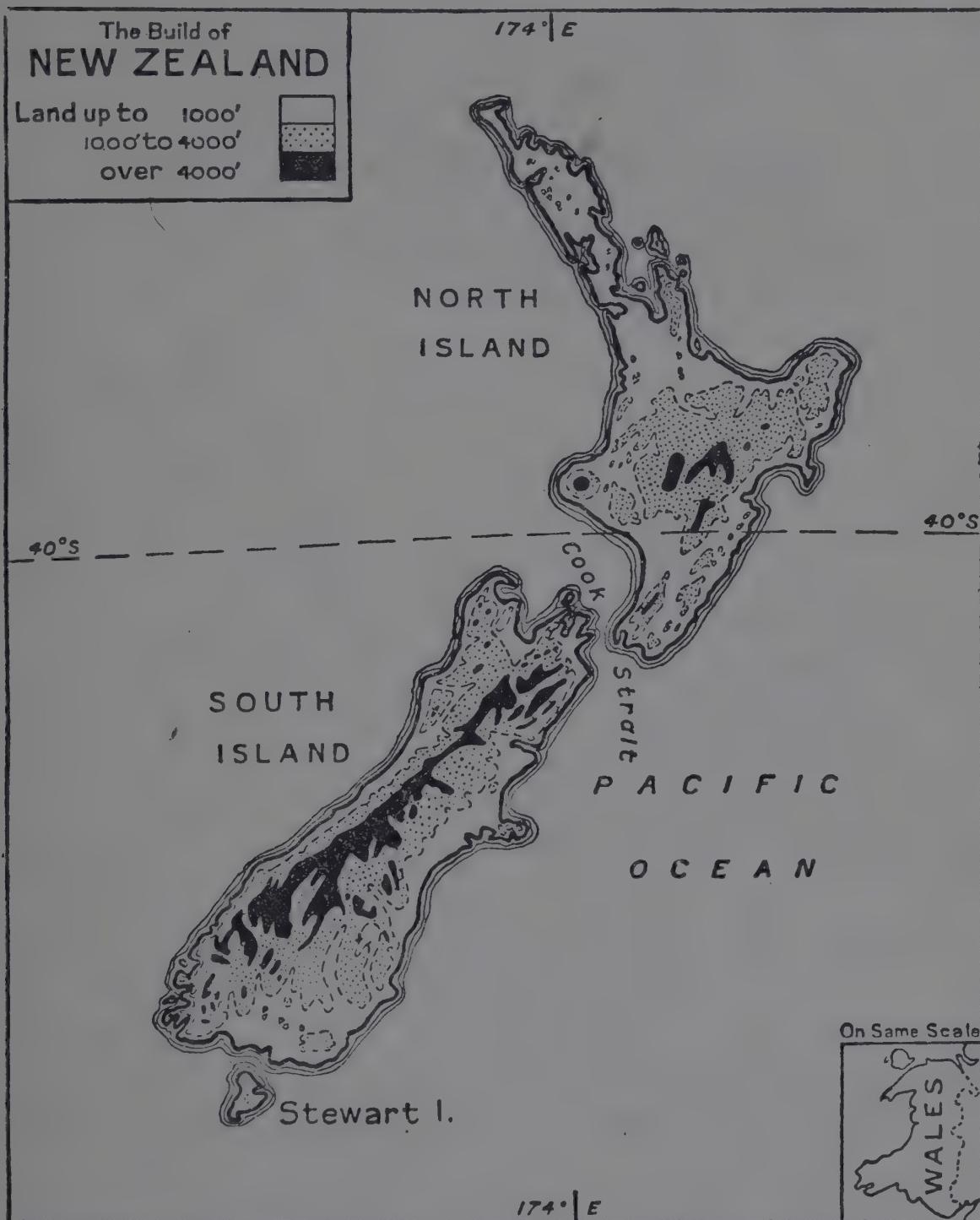


FIG. 25.

the ridge is not quite so well marked, and at least four separate ranges can be distinguished. Owing to the

position of the backbone the plains in the south fringe the east coast; in the north they fringe the west coast. Within North Island there are many evidences of volcanic activity. We have the famous hot springs and geysers in the district of Lake Rotorua; three volcanic peaks are either dormant or active, and one peak, Mount Egmont, is extinct.

From its latitude we should expect the mean temperature of New Zealand to resemble that of Southern Europe. But the influence of the sea tends to equalise it a great deal, so that it is generally cooler in summer and warmer in winter than Italy is. South Island is closely similar to Southern England and North Island to Southern France. Since New Zealand lies full in the path of the westerlies for most of the year, the mountainous west of South Island is very wet. The eastern plains are much drier. In North Island, which the westerly wind belt reaches in winter, the climate is what we have so often styled "Mediterranean."

As usual, we give a few figures to prove what we have said.

(1) To show the moderating influence of the sea, the ranges for a number of places are stated. Note how small these are: Auckland, 15° F.; Napier, 16° F.; Wellington, 15° F.; New Plymouth, 14° F.; Hokitika, 16° F.; Christchurch, 19° F.; Dunedin, 15° F.; Invercargill, 16° F.

(2) To show the difference between west and east in the amount of annual rainfall.

New Plymouth, 80 inches; Napier, 32 inches; Hokitika, 115 inches; Christchurch, 25 inches.

(3) To show that in North Island there is rather more rainfall in the winter months than in the summer.

Auckland: four winter months = 20 inches.

" " summer " = 12 "

Wellington: similar figures = 20 inches and 14 inches.

As in Australia, sheep-rearing is the most important industry, and wool and mutton occupy the foremost position among the export values. The Canterbury Plain is the chief sheep area. Then, also as in Australia, the raising of cattle employs large numbers of the population. So much is this the case, that the annual value of butter and cheese exported is now almost equal to that of wool and mutton. Of the cereals grown, wheat and oats are the chief. About 75 per cent. of the wheat is produced in the Canterbury region, Otago and Southland produce about 20 per cent., and North Island contributes about 5 per cent. For oats the figures for the same areas are 80 per cent., 5 per cent. and 15 per cent. respectively. So far gold and coal have been the chief minerals worked. At present the richest gold-mining district lies in North Island in the region between the Bay of Plenty and Hauraki Gulf. Though the coal reserves are said to be considerable, the present annual production reaches only two million tons. Since abundant water-power is available, and since its use is rapidly developing, New Zealand is likely in the near future to become a manufacturing country.

EXERCISES

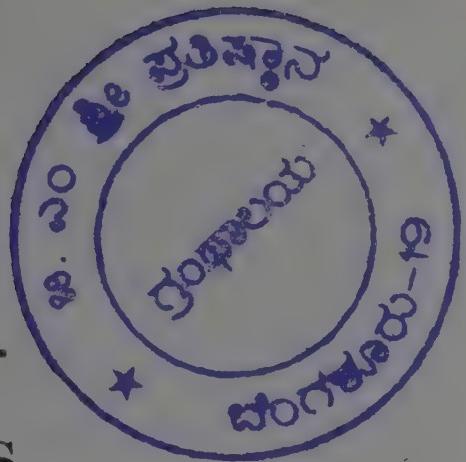
1. Look on a world map for Antipodes Island to the south-east of New Zealand. Why is this so called?
2. Most of the world maps in an atlas show the lengths of the great steamer routes. Find from one of these the distances from London or Southampton to Melbourne via the Suez Canal, via the Cape, and via the Panama Canal.¹
3. Using the scale on your atlas map of Australia, measure

¹ See the maps in the volume on *The British Empire* in this series.

the distances from Cape York to Wilson Promontory and from Steep Point to Cape Byron.

4. Measure the distance from Sydney to Auckland. Try the length you obtain on the map of Europe.
5. For Australia head three columns—Openings, Capes, Rivers. Make a full list under each heading.
6. On an outline map of Australia shade or colour in these drainage areas: (1) Gulf of Carpentaria; (2) East Coast; (3) Murray-Darling System; (4) Inland Drainage; and (5) West Coast from Arnhem Land to Albany.
7. Draw a diagram to show the rainfall for the places given in the section on rainfall.
8. In (a), (b), and (c) below are given the mean annual temperatures for three sets of places—east centre, and west. The positions of these places are from south to north. Make three diagrams to show the increases in temperature.
 - (a) East—Hobart, 54° F.; Melbourne, 58° F.; Sydney, 63° F.; Brisbane, 69° F.; Cape York, 79° F.
 - (b) Centre—Adelaide, 63° F.; William Creek (near Lake Eyre), 68° F.; Alice Springs, 70° F.; Daly Waters, 80° F.; Darwin, 83° F.
 - (c) West—Perth, 64° F.; Geraldton, 66° F.; Onslow, 75° F.; Broome, 80° F.; Wyndham, 85° F.
9. Draw a diagram to illustrate the following figures. They give, as nearly as is necessary, the number of sheep per square mile in the states of the Commonwealth. New South Wales, 150; Victoria, 140; Tasmania, 60; Queensland, 30; South Australia, 15; West Australia, 10.
10. Show by a diagram how the population of Australia has increased during the past fifty years. The figures represent millions.

$$\begin{aligned}1871 &= 1.7; \quad 1881 = 2.3; \quad 1891 = 3.2; \\1901 &= 3.8; \quad 1911 = 4.5; \quad 1921 = 5.4.\end{aligned}$$



CHAPTER XIV

THE AMERICAS

Introduction.—So far we have been dealing with the Old World, though, as a matter of fact, some parts of it, like Australia and the most of Africa, are not at all "old" in respect of discovery and development. We come now to what is called in geography the New World. By this is meant the great extent of land, stretching from well within the Arctic Circle to within 10° of the Antarctic Circle, and separating the Atlantic from the Pacific Ocean. The total length is nearly 10,000 miles. The whole is divided into two continents—North America and South America. From the map you will note that the two are rather alike in general shape and build. Both are triangular, with the base of each triangle to the north and the apex pointing southwards. Both are about the same length, but, while the bulk of North America is to the north of the Tropic of Cancer, the bulk of South America lies between the Equator and the Tropic of Capricorn. Again, your physical map will show you that in both continents the highest land is on the west, that a broad mass of uplands lies on the east, and that a great central extent of lowlands stretches between these. Even in the matter of rivers there is a resemblance. Within the central plains of each of the two are three mighty rivers, and the directions of the flow of these are roughly similar. Save at the narrow neck where the continents join they have no land boundary.

From Europe-Africa they are separated by the Atlantic Ocean. Between Newfoundland and Ireland the distance is about 1900 miles. This increases as North America tapers towards the Gulf of Mexico. The distance again decreases between Brazil and the Guinea Coast to about 1500 miles. When South America and Africa taper the distance once more increases. Note carefully how the general outlines of the opposite coasts of Europe-Africa and the Americas seem to fit, just as though the continent had at one time been rent apart. On the west, though the Bering Strait is only 100 miles across, more than 4000 miles of ocean lie between North America and Japan, and more than 6000 miles between South America and Australia. Of the two continents North America is the larger. Together they are more than four times the size of Europe, and are about half the total area of the Old World.

NORTH AMERICA

1. General.—Not since we studied Europe have we come to any part of the world as important as Canada and the United States. Carefully follow, then, all that is said about this continent. And first glance at the position which North America occupies. The Northern Hemisphere differs from the Southern in that the former has the greater part of its surface in land, while the latter has its greater part in ocean. Eurasia and North America are the great land-masses of the Northern Hemisphere. Across the North Atlantic America faces the western coasts of Eurasia, across the North Pacific the same continent faces the eastern coasts. Thus North America has a very advantageous world position. On the one side she can

send her products to the ports of Britain, Germany, and France, on the other to the ports of Japan, China, and India. Further, since the cutting of the Panama Canal, the Atlantic and Pacific ports are linked up.

Next look at the latitude position of North America. You will see from your map that the continent lies almost wholly within the north temperate zone. South of the Tropic of Cancer the continent narrows very much, north of the Arctic Circle the lands are of small account. Remember that almost the whole of Europe, North China, Japan, British South Africa, New Zealand, Victoria, and New South Wales are also temperate lands.

North America is not a compact continent like Africa and Australia. It compares well with Europe in the length of its coast-line. But its northern coast is the most deeply indented, and as this skirts an icebound ocean it is of little use for trade and commerce. Here the chief opening is Hudson Bay. On the east the two main entries are the Gulf of St Lawrence and the Gulf of Mexico. The latter is the Mediterranean of North America. Note the great island group of the West Indies. On the west coast the shores of Alaska and Canada have many islands and inlets. In the United States the largest opening is the Gulf of California.

The total area of North America is close on 8,000,000 square miles. In other words, it is about half the size of Asia and about twice the size of Europe.

2. Relief.—It has been stated already that there are three well-marked divisions in the relief of North America. These are: (1) the Western Highlands, (2) the Central Plains, and (3) the Eastern Highlands. All three run

north-south. In Eurasia the three main belts run west-east; in Australia the direction is the same as in North America.

(1) **Western Highlands.**—These, sometimes called the Pacific Cordilleras, do not consist of a single range but generally of three parallel chains. Between the chain nearest the Pacific coast and the second chain lies a great line of depressions; between the second chain and the third extends a long line of plateaux. Hence the whole system has five sections, thus:

(a) Coastal ranges; (b) line of depressions; (c) first great chain of mountains; (d) line of plateaux; (e) second great chain of mountains.

It will readily occur to you that this is very like the mid-old world fold system as it appears in Asia. There also in a north-south section we could distinguish three lines of heights, one line of depressions or basins, and one line of plateaux.

The coastal ranges extend from the islands south of the Alaska Peninsula to the Peninsula of California. In Canada they appear in detached portions such as Vancouver Island. In the United States they form a well-marked line of heights, especially in the Coast Range of the state of California. Within Canada the many straits between the islands are really breaks in the line; within the United States the main breaks are made by the Columbia and Sacramento Rivers.

To the east of the coast ranges runs the line of depressions. In Canada this is represented by the straits between the islands and the mainland. Of these, the chief is Georgia Strait between Vancouver Island and the British Columbia mainland. In the United States, Puget Sound and the Great Valley of California are central

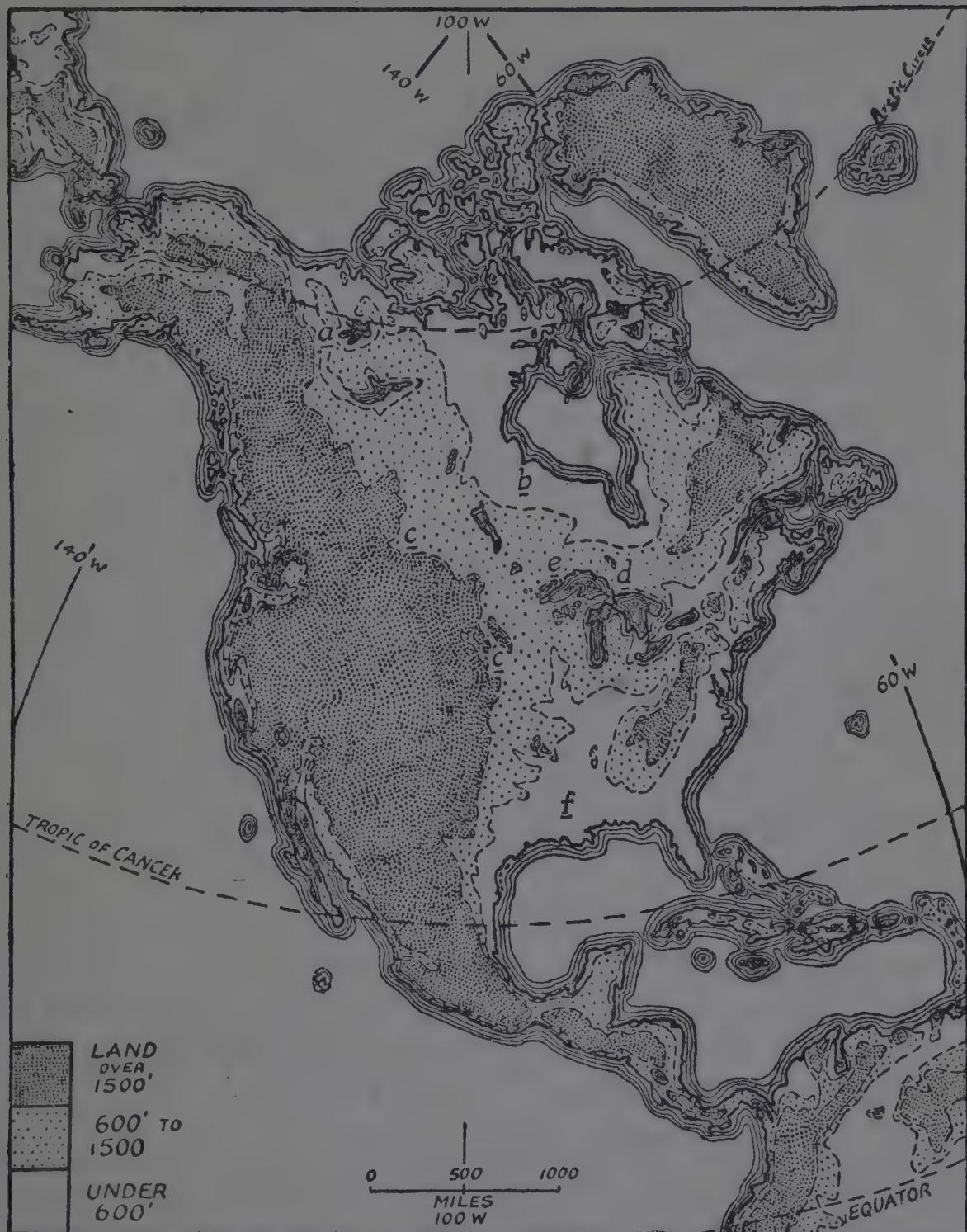


FIG. 26.—Generalised physical Map of North America.
For explanation of letters *a*, *b*, *c*, *d*, *e*, and *f*, see section (2),
pp. 134-5.

portions of the trough. In Mexico the southern end is occupied by the Gulf of California.

The first mighty chain of mountains commences with the Alaskan Ranges, where rise the great peaks of Mounts M'Kinley, St Elias, and Logan. Next comes the Cascade Range, which extends right through Canada to the borders of California. In this state the chain is continued under the name of the Sierra Nevada. Farther south the line is continued as the Western Sierra Madre. At three points the whole line is broken by the Skeena, Fraser, and Columbia Rivers.

The second mighty chain is known under the general name of the Rocky Mountains. Locally these get different titles. For instance, in Canada we find the Selkirk Range, and in Mexico the Eastern Sierra Madre. The Rockies form one of the grandest chains of mountains in the world, comparable with the Himalayas of Asia and the Andes of South America.

Between the two main chains is the line of plateaux. There we find the Yukon Plateau of the north, the Columbia Plateau, the Great Basin, the Colorado Plateau, and the Mexican Plateau.

(2) **Central Plains.**—These stretch from the Arctic Ocean to the Gulf of Mexico, and from the foothills of the Rockies to the Atlantic Highlands. Though it is said to be possible to go from the mouth of the Mackenzie to the mouth of the Mississippi without exceeding a height of 1000 feet, it must not be supposed that the extent is one vast lowland. The physical map will show you that there are at least six sections. From north to south these are (a) the basin of the Mackenzie, drained by the river and its tributaries to the Arctic Ocean; (b) the Northern Plains

surrounding Hudson Bay, and drained by such rivers as the Churchill and the Nelson; (c) the High Plains and Prairie Lands, higher than (a) and (b), running parallel to the Rockies, and drained by the Saskatchewan, Missouri, and Upper Mississippi; (d) the Great Lakes Region; (e) the Height of Land, a ridge about the 50° line of latitude, separating the Hudson Bay lowlands from the Lakes Basin; and (f) the Gulf Plains of the Lower Mississippi.

(3) **Eastern or Atlantic Highlands.**—These, of much less height than the Rockies, are cut into two sections by the estuary of the St Lawrence. To the north of the river lie the Laurentian Highlands, worn-down remnants of an ancient range. In age and form they are like the North-west Highlands of Europe and the North-east Highlands of Asia. South of the St Lawrence and running from the New England States to the Gulf of Mexico are the Appalachian Highlands. Of these, the Alleghany Plateau is perhaps the best known section, and often gives its name to the whole system. The Eastern Highlands sink to the Atlantic Plain, which to the north of the Peninsula of Florida merges with the Gulf Plain.

3. Rivers.—In a great area like North America, on account of the presence of lofty mountain chains and of surrounding seas, there is likely to be an abundant supply of rivers. Indeed a mere list of these would cover pages. We must try to limit our description of the rivers to the most important. Even then we shall have some difficulty. The Mackenzie is a mighty river so far as regards length and volume, but it empties itself into the Arctic Ocean. Compared with it, the Hudson-Mohawk, at the sea entrance to whose valley stands New York, is a small

stream, but it is of far greater importance. Again there are the Colorado and the Yosemite Rivers, both with magnificent canyons. Further, the Yukon, owing to the direction of its flow, is almost useless for trade purposes. And the same might be said of the many Hudson Bay rivers. On the other hand, most of the short rivers of the United States Atlantic coastal plain have a great commercial value. Lastly, a number of rivers do not reach the open ocean, but drain the inland Great Basin into Great Salt Lake. These will not be of much avail in trade. You will see then that the importance of a river does not depend on its length or volume. There are other things to consider—products of the basin, ease of communication with the interior, and direction of flow.

After short notes on the Mackenzie and the Nelson we shall describe somewhat more fully the St Lawrence and the Mississippi, for these two are the rivers which come to mind when we think of North America.

The head-stream of the Mackenzie is the Athabasca, which rises in the Rockies near Mount Brown. It drains into Lake Athabasca. Between this lake and Great Slave Lake the Mackenzie is known as the Slave River. In this part of its course it is joined by the Peace River, which also rises in the Rockies. Only after its exit from Great Slave Lake is the river called the Mackenzie. Two tributaries join the lower course—the Liard from the Rockies and the Bear River from Great Bear Lake.

The Nelson River is formed by the junction of the North and South Saskatchewan, both from the Rockies. The united river, still under the name of the Saskatchewan, enters Lake Winnipeg, and emerges, under the name of the Nelson, to flow into Hudson Bay. Lake Winnipeg receives

streams from Lakes Winnipegosis and Manitoba, and from Lake Rainy and Lake of the Woods and the Red River.

Both the Mackenzie and the Nelson enter seas icebound for a great part of the year. Also, since their lower courses are frozen when their upper courses are ice-free, the former are liable to floods. In this respect they are like the tundra rivers of Europe and the Siberian rivers.

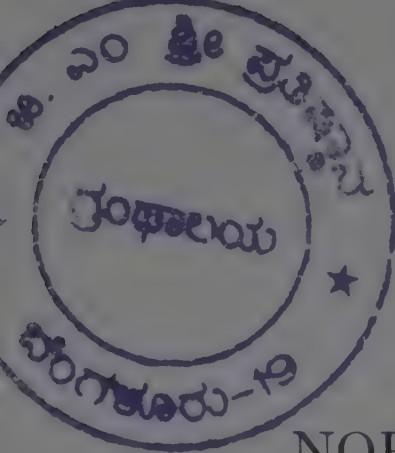
(1) **The St Lawrence and the Great Lakes.**—The head-stream of the St Lawrence may be taken as the St Louis, a tiny river which enters the western end of Lake Superior near Duluth. As a matter of fact, the name St Lawrence is not given to the river itself till it leaves Lake Ontario. Lake Superior, the first of the great lakes, is the largest freshwater lake in the world, and has an area almost equal to that of Ireland. Between Lake Superior and the next in order, Lake Huron, is the short St. Mary River. Here rapids occur, and the Sault Ste. Marie or Soo Canals have been constructed to get over the navigation difficulty. Lake Huron has an eastern offshoot, Georgian Bay, and is connected with Lake Michigan by a narrow strait. Between Lakes Huron and Erie there lies the small Lake St. Clair. The linking river is known as the St. Clair north of this lake and as the Detroit south of it. Both rivers have been deepened. The surface of Lake Huron is 20 feet below the level of Lake Superior, and that of Lake Erie is 8 feet below the level of Lake Huron. Between Lakes Erie and Ontario the Niagara River has a total fall of 300 feet. At one point it drops 180 feet. Here the famous falls are formed. For the second time in the course a canal has been cut, known as the Welland Canal. Note on your map how the Mohawk Valley seems to continue the line of Lake Ontario. During the Ice Age the

drainage found an outlet by the Mohawk-Hudson Gap to the Atlantic. The Erie Canal follows this valley. Just after leaving Lake Ontario the channel of the St Lawrence is impeded by a large number of islands. This section is hence called the Lake of the Thousand Isles. Below this point several rapids and falls occur, and the last canal, known as the Lachine Canal, has been made to avoid the main difficulty. In the lower course of the St Lawrence the chief feeder on the left is the Ottawa, on the right the Richelieu. Note how the valley of the latter is in the direct line of the Hudson Valley. By these the drainage of the lakes and river found another and later outlet to the Atlantic, while the ice sheets still blocked the estuary outlet. Across the Gulf of St Lawrence stand Newfoundland, Cape Breton Island, and Prince Edward Island. Note the Strait of Belle Isle between Newfoundland and Labrador, Cabot Strait between Newfoundland and Cape Breton Island, the Gut of Canso between Cape Breton Island and Nova Scotia, and Northumberland Strait between Prince Edward Island and the mainland.

The St Lawrence and the Great Lakes form one of the finest waterways in the world. Far more traffic passes through the linking canals than through the Suez Canal. Along the great system stand busy commercial cities like Duluth, Chicago, Detroit, Toronto, Buffalo, Ottawa, Montreal, and Quebec. Great ocean liners can reach Montreal, and large steamers can proceed to Port Arthur on Lake Superior. Everywhere the waterway is connected with the surrounding areas—the enormous grainlands of the west, the mines round Lake Superior, the huge manufacturing centres to the south of Lakes Michigan and Erie, the wealthy peninsula between Lakes

Huron and Ontario, the lumbering region by the Ottawa River, and the fur lands beyond.

(2) **The Mississippi River.**—The Mississippi rises to the west of Lake Superior within a few miles of the head-stream of the St Lawrence, but the two rivers take very different directions in their course. The former finds its way southwards across the great central plains to the Gulf of Mexico. It is navigable as far north as the Falls of St Anthony near Minneapolis. Near St Louis the Mississippi receives the Missouri. This feeder is really of greater length and volume than the main stream. Rising in the Rockies and fed by such tributaries as the Yellowstone, Platte, and Kansas, it is itself a mighty river ere it reaches the confluence. Below St Louis the chief feeders are the Ohio, from the Appalachian Plateau, and the Arkansas and Red Rivers from the Rockies. In its lower course, owing to the enormous quantities of silt brought down, the channel has been considerably raised above the level of the surrounding country. Hence banks or levees have been formed. Despite these, great floods are often caused. They may occur twice a year—the first flood comes in the month of May when the river and its feeders are in spate owing to the melting of the snow-covering of the prairies, and the second in June when the snows are melting in the High Plains and in the mountains. Another result of silting is the gradual extension of the delta into the Gulf of Mexico. The numerous delta channels are known as bayous. If the Missouri be taken as the main river above St Louis, the total length is 4200 miles, and it would then be the longest river of the world. If the Mississippi itself be looked upon as the main river, then its length is about 2500 miles.



CHAPTER XV

NORTH AMERICA: CLIMATE AND VEGETATION

4. Climate.—As usual, let us begin our survey of the climate of North America with some map-study exercises.

(a) The first striking thing about the continent is its great size, especially its extent from north to south. This will mean that we are likely to find here many varieties of climate, and that, more particularly, there will be a great difference in temperature between the south and the north.

(b) Secondly, though the continent does not lack openings, the main ones are arms of the Arctic Ocean, and hence we are not likely to have the usual moderating influence.

(c) Thirdly, look at the lines of relief. They run north-south, generally parallel to both the bounding oceans. Thus the influence of these oceans does not penetrate far inland.

(d) In the relief, also, we have noted how the Great Central Plains extend from the Gulf of Mexico to the Arctic Ocean. Within these there is no well-marked barrier, so that climatic influences from both north and south are allowed easy penetration. This is not, indeed, a great advantage, for the cold northern winter can spread its chilling hand much farther southwards than it would have done had a transverse range of mountains been present.

(e) Lastly, there are the Great Lakes. These are so large that they have some moderating effect on the temperature of the surrounding areas.

NORTH AMERICA

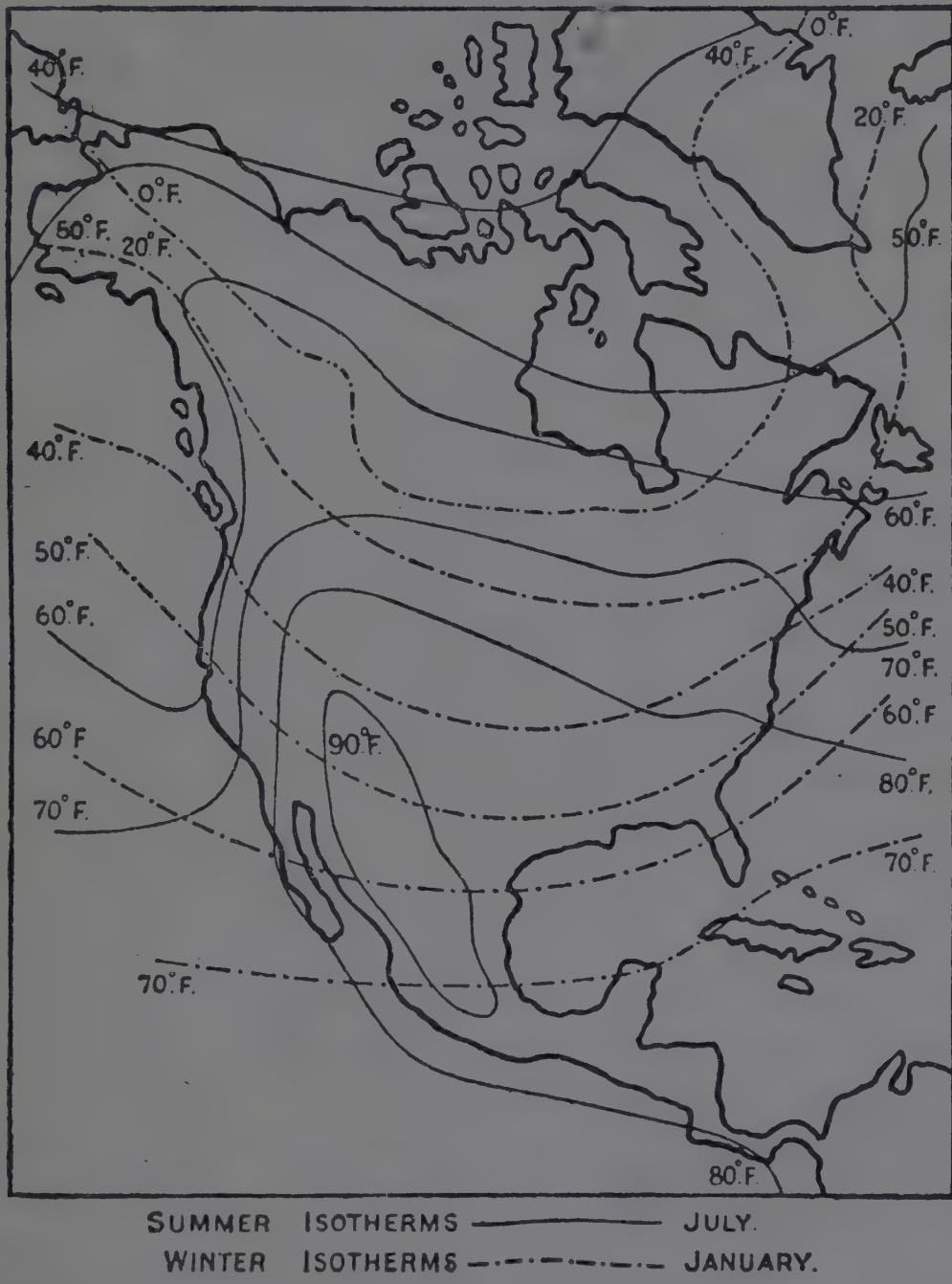


FIG. 27.

(1) **Temperature.**—The isotherm map shows you the chief isotherms for both January and July. Take the

former month first. Note how the lines are more or less parallel, from the 70° F. line which cuts the southern lobe of the Gulf of Mexico and the Island of Cuba, to the 0° F. line within which is included almost the whole of the interior of Canada. Note again the 40° F. line. On the west it touches Vancouver Island (50° north latitude), in the interior it takes a great bend as far south as the confluence of the Arkansas (35° north latitude), and on the east it reaches the Atlantic coast about Philadelphia (40° north latitude). Now the January isotherm of 40° F. in Britain runs from about Cape Wrath to the Isle of Wight, but 35° north latitude nowhere touches Europe, 40° N. crosses Sardinia, and 50° N. just reaches the southern extremity of the Cornish Peninsula. You will see then that Vancouver Island has about the same January temperature as Britain and Western Europe generally, while the interior and east of North America are both colder for their latitude. The 0° F. for Canada shows us the same fact even more strikingly. Nowhere in Europe, save in the extreme north-east of Russia, is the January temperature under 0° F. Yet in North America the bulk of Canada has a temperature below 0° F. Be certain, then, that you have gripped these four facts relative to the winter months: (a) the west has much the highest temperature; (b) the interior has much the lowest; (c) the east has a temperature between the two; (d) places in North America are colder than those of the same latitude in Europe.

Now turn to the July isotherms. We see some striking changes. The 40° F. isotherm, which reached so far south in winter, includes for July only the most northerly of the Arctic islands; the 70° F. isotherm now reaches

the Canadian boundary; and a large tract in the south-western part of the central plain is actually over 90° F. But note carefully how the isotherms run. In winter they bent southwards over the interior, for it was colder than the coasts; in summer they bend northwards, for the interior is now warmer than the coasts.

These facts about temperature are just what we expected to find. They are the results of the physical factors. Remember in particular the effect of the western mountains in barring off the influence of the Pacific, so as to lower the temperature of the interior in winter and raise it in summer. This effect is increased in the plains by the easy spread of the cold from the north in winter and of the heat from the south in summer.

(2) Rainfall.—The map shows very clearly the distribution of rainfall. We must try to account for the differences in amount. To begin with, we find on the Pacific coast of British Columbia and of two of the States a heavy rainfall of over 50 inches. Why is this? These places are like West Europe—they receive the full effect of the westerlies. As the winds have crossed the Pacific and are therefore moisture-laden, the lands which they meet in their path are likely to have pretty heavy rains, all the more so if the lands are mountainous. Next look at the other patch showing heavy rains. It occurs in the Gulf of Mexico area, especially in Florida and Central America. Again we ask why this should be so. The answer is that, just as the first area comes within the influence of the westerly winds, so this comes under the influence of the north-east trades. Like the westerlies, these shift north and south with the sun, so that while some parts of Central America have considerable rain in

the winter, in summer Florida receives its greatest amount. The third area to invite question is the Californian region. Here the rain is not heavy and comes mainly in winter.



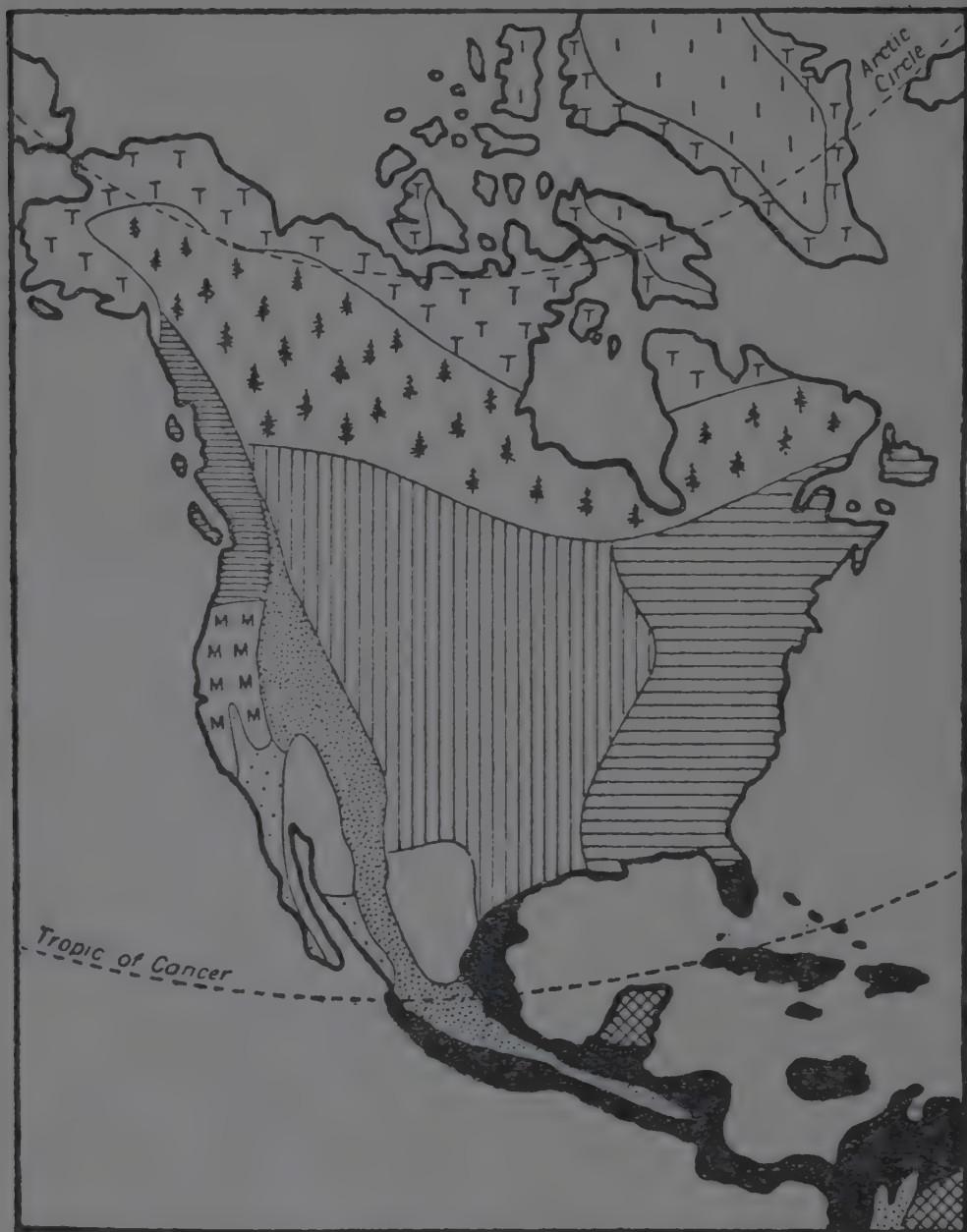
FIG. 28.—North America.
Winds and rains during the year.

This is a "Mediterranean" belt. Farther south we reach, on the long Peninsula of Lower California and in the Mohave and Colorado Deserts, an almost rainless region,

akin to the Sahara and the Kalahari. Behind the great barrier of the Pacific Cordilleras lies what is called a rain shadow, where, though the rain is not altogether lacking, it is not at all heavy. You will note that the rainfall grades off from over 50 inches to between 25 inches and 50 inches in the mountain zone, and then drops to below 25 inches and even to below 10 inches in the interior. On the east from Labrador to the Gulf of Mexico lies an area where the rainfall is between 25 inches and 50 inches. In the northern section of the belt a great part of the fall takes the form of winter snows.

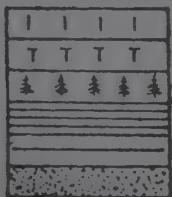
5. Natural Vegetation Regions.—It is not necessary to say a great deal about the vegetation of North America, for the zones practically repeat those we have already described in the Old World, especially in Eurasia. Twelve fairly distinct natural regions may be given. In the main these are dependent on rainfall. Where the rainfall is very heavy and the temperature high, you will find the tropical forests, as in Florida, the West Indies, and Central America. In the Yucatan Peninsula, where the rainfall is slightly less than elsewhere in the region, the tropical forests are replaced by savannas. Where the rainfall is heavy or fairly heavy, you will find the deciduous forests, that is, those whose trees shed their leaves in autumn. The forests vary in type according to the temperature. Thus there is a difference between the Pacific coast forests of British Columbia and the Atlantic coast forests of the eastern provinces and states. Where the rainfall is less heavy and the winter temperature fairly severe, you will find the coniferous forests, that is, those whose trees are evergreen with needle-shaped leaves to

NORTH AMERICA



NATURAL REGIONS.

**Ice Cap
Tundra
Pine Forest
Pacific Forest
Atlantic Forest
Mountain**



Mediterranean
Desert
Scrub
Grass Land
Savanna
Tropical Forest

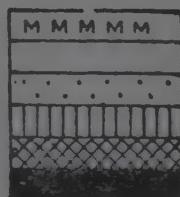


FIG. 29.

stand the summer drought and to bear the winter snows. Note the great belt of pine forests across Canada. Where the rainfall is still less heavy and the summer temperature high, you will find the grasslands of the central plains, known in North America as the prairies. Where the rainfall comes only in winter and the summers are warm, you will find the typical evergreens of the "Mediterranean" region, as in California. Where the rainfall is almost lacking, the trees are replaced by stunted shrubs and prickly bushes, as in the scrublands, which in their turn give way to the arid hot deserts and semi-deserts. In the far north by the shores of the Arctic Ocean we find the tundra or barren lands, so well developed, as we have seen, in Siberia. Add to these ten regions the frozen ice-cap within the Arctic Circle and the belt where the western mountain system is at its widest, and you have the twelve regions.

CHAPTER XVI

NORTH AMERICA: INDUSTRY AND COMMERCE

6. Occupations — (1) Agriculture. — In North America, since the great plains are confined to the interior, it is there we are likely to find agriculture carried on extensively. We must omit the tundra of the extreme north, the belt of coniferous forests, and the strip of hills bordering on the Rockies. But even then we have an enormous tract of land available for the growth of crops. The type of crop will, of course, depend on the climate. In a general way the climate of the plains becomes drier and more extreme from the Gulf of Mexico northwards. We must remember however that in the northern section of the lowlands there is a heavy snowfall. The snow covering keeps the ground from freezing very deeply and the melting snows soak the soil in spring. One foot of snow is roughly equal to one inch of rain. Within the great area mentioned there are three main belts—the wheat belt in the north, the maize or corn belt in the centre, and the cotton belt in the south. These three are not, of course, absolutely separate ; they grade off into each other.

(a) The Wheat Belt.—Wheat needs a fairly heavy soil. It finds this in the plains, for the Ice Age has left a thick covering of clays. Indeed the Red River Basin, the finest wheat district, is part of the bed of an ancient lake which included also the present Lake Winnipeg. As

regards climate, wheat belongs to the temperate zone. If you consider where else in the world it is grown, you will find that it flourishes best in inland areas, e.g. the plains of Hungary and South-west Russia. There the summers are very warm, the winters are cold, and the rainfall is not at all heavy. Now these conditions are present in the northern section of the central plains. The melting snows act the part of spring rains, the summers are very warm, and the winters are severe. In Canada the four chief wheat provinces in order are—Saskatchewan, Alberta, Manitoba, and Ontario. Across the boundary the ten chief wheat states are—Kansas, North Dakota, Nebraska, Oklahoma, Montana, Ohio, Minnesota, South Dakota, Illinois, and Indiana. (We do not mean you merely to learn up the names of the provinces and states. Go over them carefully on your map.) Canada had $22\frac{1}{2}$ million acres under wheat and the United States of America 58 million acres in 1928.

For Canada, Winnipeg is the main market centre, Fort William and Port Arthur on Lake Superior are the chief ports. For the United States, Chicago is the main market centre, Duluth, Buffalo, and Milwaukee are the chief lake ports. Winnipeg stands at the junction of the Red and Assiniboine Rivers. It is the great connecting link between eastern and western Canada and the focussing centre for the railway systems. Other Canadian towns of the wheat belt are Brandon, Regina, Moosejaw, Saskatoon, Calgary, and Edmonton. In the near future, too, Port Nelson on Hudson Bay, linked by rail with the Winnipeg lines, may become a wheat port in addition to the two ports on Lake Superior. Across the boundary line the whole belt is studded with towns and covered with a network of

railways. Chicago, the second city in U.S.A., is, as we have said, the chief centre for the wheat trade. Note its favourable position at the southern end of Lake Michigan, close to the Upper Mississippi, in the very heart of the zone, and touching also the maize or corn belt. Note, too, how the railway lines from the wealthy region to the north and west must pass through Chicago to round the lake. In 1840 the city had only 5000 inhabitants, to-day it has over 2,000,000. St Paul and Minneapolis are twin cities at the head of the navigation of the Mississippi. The two are large grain-collecting depots, and Minneapolis has become the greatest milling centre of the States. Milwaukee possesses large tanneries. Duluth exports iron as well as grain. Detroit is an important railway centre. Cleveland and Toledo are iron manufacturing towns. Buffalo owes its importance to its position at the lake end of the Erie Canal which makes use of the Mohawk Gap.

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(b) **The Maize Belt.**—Since maize needs a warmer climate than wheat, the belt where it is grown lies generally to the south of the one already described, though several states grow both grains very well. The chief maize states are Iowa, Illinois, Missouri, Nebraska, Indiana, Kansas, and Ohio. No less than 105 million acres are under maize. The crop is grown more for fattening cattle and hogs than for human food. Thus Chicago, in addition to its being the main wheat market, has a large slaughtering and meat-canning industry. St Louis, a great river port and railway centre, has become the chief maize market. Other towns of the belt are Omaha, Kansas City, and Cincinnati. As in the wheat zone, the industries do not wholly centre round agriculture and its attendant occupations. The

maize belt, especially on the east between the Mississippi and the Appalachian Mountains, is abundantly rich in coal and iron. Hence in the Ohio Basin we find great manufacturing centres. We must mention in particular the busy cities of Louisville, Cincinnati, and Pittsburgh.

(c) **The Cotton Belt.**—As we get nearer the Gulf of Mexico within the broad basin of the Lower Mississippi, we reach the area where the climate is hot enough and wet enough for the growth of cotton. Of the cotton states Texas is by far the chief. Then in order come Oklahoma, Mississippi, Arkansas, Georgia, Alabama, North Carolina, South Carolina, Louisiana, and Tennessee. Altogether there are about 40 million acres under cotton. You will notice in the first place that the belt goes out from the Gulf region to the South Atlantic coastal plain. And in the second place you will see that many states with a large area and yield are not on the Gulf itself but somewhat inland. Along the coast the rain is rather too heavy for cotton, and rice and sugar-cane take its place. The chief sugar state is Louisiana, but the cane is grown also in South Carolina, Georgia, Florida, and Alabama.

Within the cotton zone Memphis and New Orleans are the chief markets. Galveston and New Orleans are the great cotton-exporting towns, but most of the Atlantic and Gulf ports, as Charleston, Savannah, Pensacola, Tampa, and Mobile, act as outlets for the products of the region.

So much for the three great belts of the central plains. But there are other agricultural occupations which we must also mention. The growing of oats is carried on all over Eastern Canada, but especially in Ontario and Quebec. We find the crop also in the wheat belt. In

fact the Canadian oats yield is higher than the wheat yield, though the acreage (14 million acres) is less than that for wheat. In Canada dairy-farming is rapidly becoming a very important industry. At present the chief provinces are Ontario and Quebec. In the United States dairy-farming has assumed great proportions and the figures are almost colossal. The pounds of milk and butter produced run actually into thousands of millions, and the pounds of cheese reach 400 millions! Fruit-growing is extensively carried on. In the Maritime Provinces, in British Columbia, and in the New England states, all the temperate fruits, but especially apples, flourish. The Mediterranean fruits, like grapes, figs, prunes, apricots, and oranges, have found a very congenial home in California, while the tropical and sub-tropical fruits, such as pineapples and bananas, are grown to perfection in Florida and the West Indies. Within the United States an enormous trade is done in dried and canned fruits and vegetables. In the States something like 2,000,000 acres are under tobacco cultivation. The chief tobacco areas lie in Kentucky, North Carolina, Virginia, Tennessee, and South Carolina. Cuba in the West Indies also carries on this industry.

The rearing of cattle, sheep, horses, and hogs is widespread. In Canada mixed farming is the rule, but the main states for raising farm animals are Quebec, Ontario, Manitoba, Saskatchewan, and Alberta. In the United States the industry is more specialised. Sheep are reared in a great many of the states but especially in the Upper Mississippi and Ohio Basins, in the Pacific states, and in the mountain states. As we have already noted, the United States stands second as a world supply area for

wool. In the great ranching states of the Western Mississippi Basin, and indeed over most of that basin, vast numbers of cattle and horses are raised. The following numbers, representing millions, will perhaps give you some indication of the importance of farm animals: Horses, 14; sheep, 42; hogs, 55; cattle, 56.

(2) **Lumbering.**—We need not describe the lumbering industry to you, for you must all have read descriptions of it in many books of travel and in novels dealing with Canadian life. Within the coniferous zone, firs and pines are the chief trees. Between Hudson Bay and the St Lawrence and in the Maritime Provinces, aspens, maples, oaks, and birches grow over wide areas. Of the North Ontario and Quebec forest region Ottawa is by far the chief centre; it is said to have the greatest sawmills in the world. In Newfoundland lumbering is rapidly growing. There Grand Falls is the chief centre. Within the Maritime Provinces the chief centres are Fredericton and St John. British Columbia also possesses an extensive lumber industry. There the gigantic Douglas fir flourishes. The chief centres are Vancouver and Prince Rupert. In Canada, as elsewhere in North America, the attendant industries of pulp- and paper-making have grown up alongside the actual lumbering. Within the United States the main timber regions occupy the Appalachian Plateau (especially the New England hills and the Adirondack Mountains), the mountain states and the Pacific coast states. The first-named area was at one time heavily wooded, but the timber is being rapidly used up. At present the Pacific states stand first in the amount of timber cut. Of these the most important are Washington, Oregon, and California. Next in order of importance is

a group of mountain states—Idaho, Montana, Wyoming, Arizona, and Colorado. On the west, yellow pines, Douglas firs, cedars, and redwoods grow to a great height. There the chief timber ports are Seattle, Tacoma, and Portland.

(3) **Fishing.**—Possessing a coast-line of something like 18,000 miles, and much of it within the northern parts of the temperate zone, Canada is bound to have rich fishing-grounds. Off Newfoundland lie some of the finest “banks” in the world. Here are caught cod, herring, haddock, and mackerel. Along the shores of the Maritime Provinces lobster-fishing employs a considerable number of people. In the east-coast fisheries the New England states share. The waters of Hudson Bay are known to teem with fish, though the fishing industry has there scarcely made a start. In the west the chief fish caught is the salmon. Hence the canning industry has been greatly developed, especially in British Columbia and in the neighbouring state.

(4) **Mining**—(a) **Canada.**—British North America is rich in mineral wealth, though as yet it is not greatly worked. In total value of mineral products the chief mining provinces rank in the following order: Ontario, British Columbia, Alberta, Nova Scotia, and Quebec. The main metals are gold, silver, nickel, copper, lead, and zinc. Of the non-metals coal is by far the chief mineral product. Ontario is rich in many metals, but especially in gold, silver, nickel, copper, and iron. The province also possesses petroleum wells. Sudbury is the source of the world’s largest supply of nickel. Round Cobalt and Port Arthur there are very valuable copper, silver, and iron mines. British Columbia has deposits of coal, iron, gold,

silver, lead, copper, and zinc. Of these, the chief are coal and copper. The mining of iron ore is as yet undeveloped. Within the province the main centres are round Crow's Nest Pass and in Vancouver Island. Alberta is said to possess about 17 per cent. of the coal reserves of the world. Lethbridge is the chief centre. Besides coal, the province has rich stores of petroleum, though the amount produced is as yet not large. In Nova Scotia coal is the chief mineral. The richest seams are in Cape Breton Island. Sydney is the principal mining town. From Quebec province comes about three-fourths of the world's supply of asbestos. Another important mineral is mica. Apart from these five provinces, Manitoba, Newfoundland, and the Yukon territory are also known to be rich in minerals. The first named is said to possess gold and copper deposits of vast extent. The second has great deposits of iron, as yet scarcely worked. The chief product of the third is gold, mined in the Klondyke district chiefly round Dawson City.

(b) **United States.**—In total value of mineral wealth and in total amount produced the United States stands first in the world. We cannot hope, then, to give you anything more than a very brief summary.

Of the metallic products iron comes first in value and copper second. Then there follow, but at a good distance, lead, zinc, silver, gold, aluminium. Of the non-metallic products coal comes a very easy first, its value being quite twice that of copper. Petroleum is second. Then there follow natural gas, cement, and salt.

Within the States there are two main coal areas—we do not say coalfields, for many fields occur in each of the two areas. The first area is found in the Appalachian Plateau,

especially in the Western Appalachians in a great stretch from Pennsylvania in the north, through West Virginia, East Kentucky, and East Tennessee, to North Alabama in the south. Pittsburgh is the main town of the north and Birmingham of the south. The second area occupies much of the middle region of the Missouri-Mississippi Basin. In this central region the chief coal states are Illinois, Missouri, and Arkansas. A third stretch of much less importance runs through the mountain states from Montana to New Mexico. This consists of a number of detached and minor coalfields. The United States produces about 500,000,000 tons of coal yearly. Compare this with the 270,000,000 tons produced by Britain and the 120,000,000 tons produced by Germany.¹ By far the richest mines occur round Pittsburgh, where nearly one-fourth of the total supply of the States is raised. The central coalfields are not nearly so rich as the Appalachian. Of all the states, Pennsylvania is the main coal producer.

For the production of petroleum the three chief states are Oklahoma, Texas, and California. The first and second form part of a great oilfield situated in the tract of land between the lower Missouri and Mississippi and the Rockies. This field is continued into Mexico. Oklahoma produces one-sixth of the world's oil. A second great oilfield is found in the area enclosed by the lakes, the Upper Mississippi, and the Northern Appalachians. The chief district within the area is the Ohio Valley. The state of California is the third main supply area. We have put it third because of its position on the map. As a

¹ This omits the German lignite, which is now more than equal to the bituminous coal.

matter of fact it produces close on four times the amount of the Appalachian oilfield. The United States on the whole produces 68 per cent. of the world's supply and Mexico produces about 4 per cent.

The richest ironfield in the States is found to the west of Lake Superior. Here is mined almost one-third of the total world's supply of iron. Minnesota is by far the chief iron-ore state.

For copper the main mines lie in the mountain states, especially Montana, Utah, and Arizona. Round Butte in Montana are said to be the most important copper mines in the world.

Of the two more precious metals, gold and silver, the chief mining centres are found in the Pacific and mountain states, especially in California, Colorado, Alaska, and Nevada. Next to the United States, Mexico is the main silver producer. Canada comes third.

CHAPTER XVII

NORTH AMERICA: INDUSTRY AND COMMERCE—*continued*

7. Manufactures, Trade, and Commerce.—The notes and figures below are intended merely to indicate to you the most important industries and the main industrial centres. We give in the first place two lists—one list showing the values in **million dollars** of the chief exports of Canada, and a second showing the same for the United States. From these you will gather how the various industries stand. You should carefully compare and contrast the lists—much may be learnt from such an exercise.

<i>(a) The Exports of Canada, 1928.</i>		<i>(b) The Exports of U.S.A., 1927–28.</i>	
Wheat and flour . . .	412	Raw cotton . . .	821
Wood and wood pulp . . .	146	Petroleum and products .	482
Paper, and manufac- tures of	135	Machinery . . .	464
Iron and iron goods . . .	63	Motor-cars and parts .	425
Motor-cars and parts . . .	28	Grain and preparations .	401
Furs	24	Iron and steel manu- factories	233
Cheese	21	Cotton manufactures .	214
Live cattle and sheep . . .	19	Copper and manufac- tures	165
Nickel	17	Tobacco	155
Copper	16	Wood manufactures .	147
Bacon and ham	12	Animal fats and lard .	117
Silver	12	Fruits and nuts . . .	116
Gold-quartz	9	Coal and coke . . .	93
Canned salmon	9		
Sugar	8		
Fruits	6		

Why is coal so low on the (b) list?

In the second place we give the names of a number of the chief towns for both Canada and the United States. To the names we have added the populations and a few brief notes.

(a) CANADA.

Montreal (618,000)	Chief city of Canada ; at the limit of ocean navigation ; headquarters of the great railways.
Toronto (520,000)	Second city ; many manufactures.
Winnipeg (179,000)	Largest wheat market in the world ; great collecting centre.
Vancouver (117,000)	Chief port for Pacific trade ; sawmilling and canning.
Hamilton (114,000)	Important lake traffic.
Ottawa (107,000)	Sawmilling ; making of agricultural implements.
Quebec (95,000)	Great river port.

(b) UNITED STATES.

(1) New England States— Boston (748,000)	Second seaport of the States ; great coastal trade.
(2) Eastern Appalachians and Atlantic Plain— New York (over 5,000,000).	Half the trade of the whole country ; very wealthy hinterland with all sorts of supplies ; splendid situation at the entrance to the Mohawk-Hudson Gap ; main gateway to America.

(b) UNITED STATES—*continued.*

Philadelphia (1,800,000)	Great river port ; exports coal ; manufactures machinery, locomotives, and steel ships.
Baltimore (733,000) .	Exports wheat ; manufactures cotton.
Washington (437,000) .	Political capital.
Richmond (171,000) .	Tobacco market.
(3) Western Appalachians and Eastern Lakes—	
Buffalo (506,000) .	Great lake port at end of Erie Canal.
Cleveland (796,000) .	Established first to secure iron ore from the Lake Superior region for Pittsburgh ; now manufactures iron and steel goods.
Detroit (993,000) .	Enormous lake traffic ; manufactures motor-cars.
Pittsburgh (588,000) .	Centre of iron industry and petroleum refining ; great river port.
Birmingham (178,000)	Southern centre for coal- and iron-mining.
(4) Central Plains—	
Duluth (100,000) .	Chief grain outlet ; iron-mining centre.
Milwaukee (457,000) .	Great lake port ; tanneries.
Chicago (2,700,000) .	Second city ; wheat market ; meat packing ; canning ; soap and candles ; lake port and railway centre.
Minneapolis (380,000)	Flour-milling.
St Paul (234,300) .	Publishing centre.
St Louis (772,000) .	River port ; railway centre ; maize market.
Cincinnati (401,000) .	Iron and steel goods.

(b) UNITED STATES—*continued.*

Louisville (234,000) .	Tobacco market.
Kansas City (324,000) .	Market, and meat - packing centre.
New Orleans (387,000)	Gateway to the Mississippi Basin ; cotton trade.
(5) Mountain States—	
Denver City (256,000).	Mining centre.
(6) Pacific Coast—	
San Francisco (506,000)	Asiatic trade ; railway terminus.
Los Angeles (576,000)	Oil and wheat.
Seattle (315,000) .	Pacific trade ; canned fruits and salmon.

From all that has been written about the many and varied occupations, and especially about the mining industry, and from the notes on the chief towns, you will learn all you need to know at present about the density of population in North America.

8. Railways—(a) Canada.—Canada possesses two great railway systems with a total mileage of close on 40,000. In proportion to its population the Dominion has more miles of railway than any other country.

(1) **The Canadian Pacific Railway (C.P.R.).**—This is the only fully completed transcontinental line in Canada. The main line starts at Montreal and runs through Ottawa, Sudbury, Fort William, Winnipeg, Brandon, Regina, Moosejaw, Medicine Hat, Calgary, and Kicking Horse Pass, to Vancouver. Its total length is close on 3000 miles, but over and above this the C.P.R. has something like 12,000 miles of branch-lines. Perhaps the most

important of these run from St John to Montreal and from Montreal to Toronto and Detroit.

(2) **The Canada National Railway (C.N.R.)** is the property of the Dominion Government. It includes a number of divisions which a few years ago were separate systems, viz., the Intercolonial Railway, the Canadian Northern Railway, the Grand Trunk Pacific Railway, the Transcontinental Railway, and the Grand Trunk Railway. (a) The Intercolonial Division runs from Halifax to Montreal and carries the trade of Nova Scotia and New Brunswick. Halifax is the rival terminus to St John of the C.P.R. (b) The Canadian Northern Division passes through Port Arthur, Winnipeg, Edmonton, and the Yellowhead Pass, to Vancouver. (c) The Grand Trunk Pacific Division links Winnipeg, through Saskatoon, Edmonton, and the Yellowhead Pass, to Prince Rupert. (d) The Transcontinental Division starts at Moncton (in New Brunswick), a junction on the Intercolonial Division, and runs through Quebec to Winnipeg. (e) The Grand Trunk Division has a portion of its system in Canada. Within the States it commences at Portland and runs through Maine to Montreal. The latter town and Chicago are linked by its main line, but the whole of the very busiest regions of Ontario is covered by a network of its branches.

(b) **United States.**—In Canada the principal relief difficulty which the railways have to encounter is getting over the Western Mountains, for on the east the St Lawrence Valley provides a fairly easy passage and the Eastern Highlands are not high. In the United States where the Eastern Plateaux form a distinct barrier and where the Western Mountains are both very wide and

very high, the transcontinental railways have considerable obstacles to surmount. Any good map will show you that in the Atlantic Coastal Plain the lines are numerous, that in the Appalachian Plateau they are fewer and pierce the highlands by gaps, that in the Central Plain they form a perfect network, that in the Western Mountains they are again few, and that in the Pacific States they once more are numerous. We need not try to burden you with details; it will be sufficient to summarise the three systems which cross the continent.

(1) **The Northern Pacific Railway**—New York, Pittsburgh, Chicago, St Paul, Yellowstone and Columbia Valleys, Portland.

(2) **The Union Pacific Railway**—New York, Pittsburgh, Chicago, Omaha, Ogden, Salt Lake City, San Francisco.

(3) **The Southern Pacific Railway**—New York, the Atlantic Coastal Plain cities, New Orleans, El Paso, Los Angeles, San Francisco.

Note on the Panama Canal.—This canal is cut through the Isthmus of Panama and links the Caribbean Sea (Atlantic Ocean) and the Bay of Panama (Pacific Ocean). The two termini are Colon and Panama. In length (50 miles) it is exceeded by the Kiel Canal (61 miles) and the Suez Canal (90 miles), but for depth and width it is easily ahead of these. The cutting of this waterway at the narrow neck between the two Americas has greatly shortened distances for world ocean trade. You will see how true this is from a few figures. Take the comparative distances from Liverpool to certain places. By the Cape Horn route the distance from Liverpool to San Francisco

is 14,000 miles, by the Panama route, 8000 miles, a saving of 6000 miles. For Valparaiso (South America) a similar saving is 2000 miles, and for Wellington (New Zealand) it is about 1000 miles. Next take New York. By the

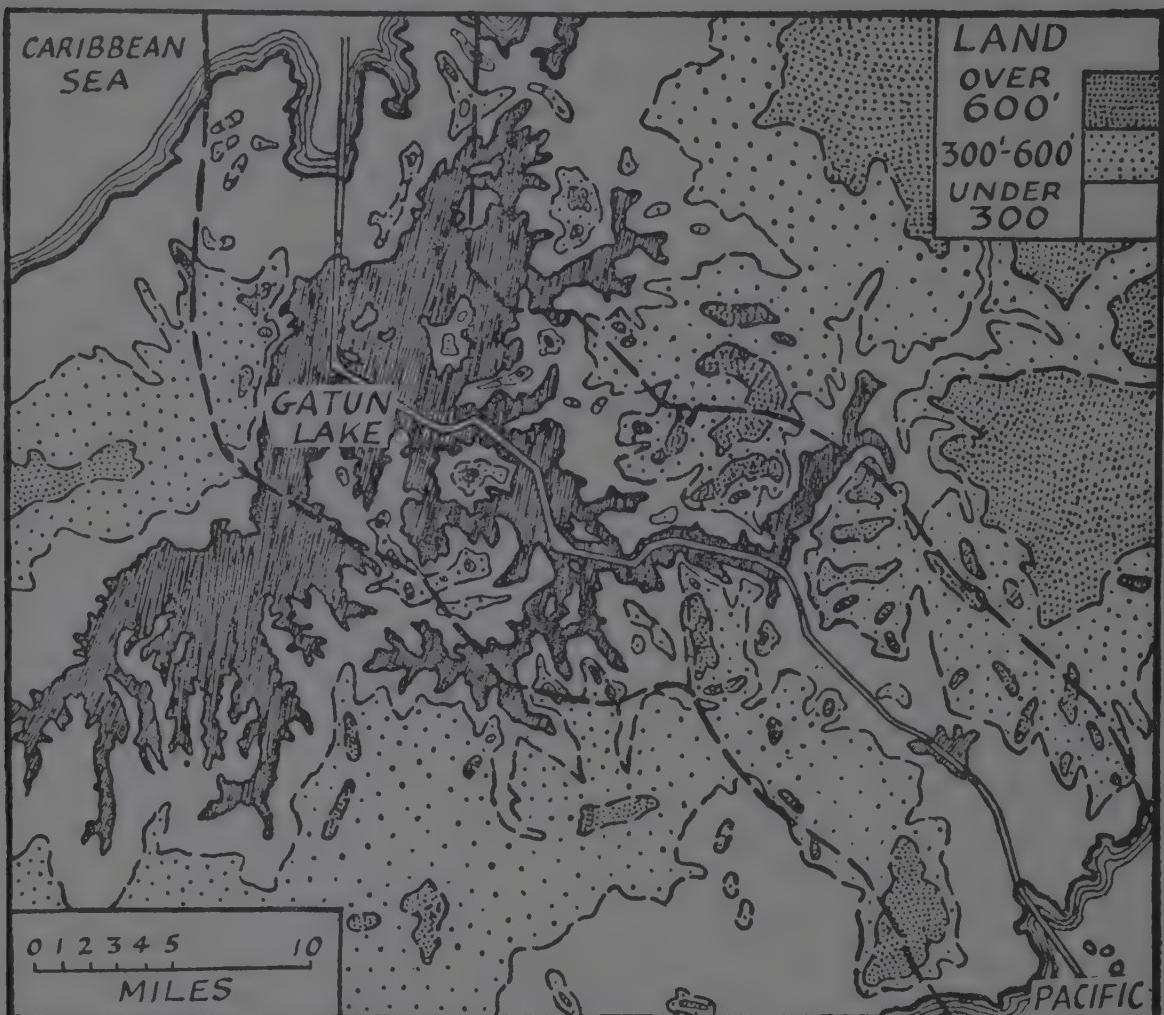


FIG. 30.—Diagram Map of the Panama Canal and the Canal Zone.

Cape Horn route the distance to San Francisco is about 13,500 miles, by the Panama route about 5000 miles, a saving of over 8000 miles. For Yokohama (Japan) a similar saving is 3500 miles.

EXERCISES

1. Measure these distances: Vancouver Island to Newfoundland; San Francisco to New York; Cape San Lucas (Peninsula of California) to Cape Sable (Peninsula of Florida) across the Isthmus of Tehuantepec, and across the Isthmus of Panama.
2. Look on the map of North America for places on the same latitude as (1) the Shetland Islands; (2) Land's End; and (3) Sardinia. Note carefully how much of the Continent is south of 40° north latitude.
3. Make a list of the peninsulas of North America.
4. Name at least twelve capes and ten islands on or round the coast.
5. Carefully note the straits. As usual draw up a list, giving the lands or islands separated and the seas or openings connected.
6. What are the six rivers referred to in the general paragraph on North America? Compare the two sets.
7. Take the following as the five drainage areas: Pacific Ocean, Arctic Ocean and Hudson Bay, Atlantic Ocean, Gulf of Mexico, Inland Basins, and make short lists of the rivers within each area.
8. Make a sketch map of the Hudson-Mohawk Valley. Mark in the Catskill Mountains, the Adirondack Mountains, and the Green Mountains; the Hudson, the Mohawk, the Richelieu, and the St Lawrence rivers; Lakes Champlain and Ontario; and Montreal, New York, Albany, Syracuse and Buffalo.
9. Draw a sketch map of the St Lawrence and Great Lakes. Enter the names of the lakes, rivers and main towns.
10. Make a comparative diagram to show these river lengths: Mississippi-Missouri, 4200 miles; Mississippi, 2500 miles; Mackenzie, 2500 miles; St Lawrence, 2000 miles; Nelson, 1600 miles.
11. Draw a detailed map of the St Lawrence estuary.
12. The following are the ranges of temperature for a number

of places in Canada. Can you account for the differences?

Victoria, 21° F.; Halifax, 41° F.; Toronto, 48° F.;
Port Arthur, 55° F.; Winnipeg, 68° F.

13. The following are the mean monthly temperatures for Victoria (Pacific Coast) and Port Arthur (Central Plain). Draw the two graphs.

Victoria: 40.1° , 41.6° , 44.2° , 48.9° , 53.5° , 56.1° ,
 60.8° , 60.2° , 56.6° , 51.5° , 45.8° , 42.8° .

Port Arthur: 7.0° , 7.4° , 19.1° , 35.1° , 45.9° , 56.4° ,
 62.2° , 59.9° , 52.8° , 41.6° , 26.9° , 14.4° .

14. We give below two sets of mean annual rainfall figures. Draw two comparative diagrams and try to account for the differences within each of the two.

(1) West Vancouver Island, 100 inches; Calgary, 16 inches; Regina, 14 inches; Port Arthur, 23 inches; Ottawa, 32 inches; Halifax, 57 inches.

(2) San Francisco, 23 inches; Sacramento, 19 inches; Denver, 14 inches; Washington, 41 inches.

15. Copy and colour the natural vegetation map.

16. On an outline map of North America show by some scheme of colouring the three belts—wheat, maize, cotton.

17. What are the main facts you learn from a comparative study of the lists given of the exports from Canada and the United States of America?

18. Make two comparative diagrams for the five main exports of each country.

19. Draw a sketch map of the C.P.R. On it mark the products of the various regions traversed by the route.

20. Below are the populations in millions of the United States for a number of years. Show these in diagram form.

$1870=38$; $1880=50$; $1890=62$;
 $1900=76$; $1910=91$; $1920=105$.

CHAPTER XVIII

SOUTH AMERICA

1. General.—We have already seen that the two Americas are in shape rather alike—broad in the north and tapering to the south. But while North America is at its widest in cold regions, South America is at its widest in very warm regions. As Cape Gallinas, the farthest north point of the latter continent, is in latitude 12° N., and as Cape Horn, the farthest south point, is in latitude 55° S., then, owing to the great tapering, the bulk of South America lies within the Tropics. You will note from the map that the continent is not at its very widest where the Equator crosses it but where it is cut by the line of 5° S. This means that the main mass lies between the Equator and the Tropic of Capricorn. Australia, Africa, and South America are the three southern continents. It is worth while to compare their general positions. In Africa the 12° N. line of latitude cuts across at the widest part; in Australia Cape York is about 12° S. In Africa Cape Agulhas, the farthest point south, is in latitude 35° S., and even the farthest south point of New Zealand does not quite reach 48° S. latitude. On the whole South America is not so far north as Africa, nor is its main bulk so far south as Australia.

South America is much more compact than North America. Indeed openings and peninsulas are almost entirely absent. It is important to note that the three

southern continents are alike in this respect. Though South America is almost twice the size of Europe, yet its coast-line is just three-fourths the length of that of the smaller continent.

2. Relief.—In general build South America is closely akin to North America. We find in the former the same three divisions—Western Mountains, Central Plains, and Eastern Highlands.

(1) **Western Mountains.**—On the whole these are more continuous and more lofty than in North America. Just as the name Rockies has sometimes been given to the Western Mountains of the one continent, so the name Andes is often applied to the similar mountain system in the other. In North America we could trace throughout three chains, one great line of depressions, and one line of mighty plateaux. We do not find these five divisions so clearly marked in South America. Beginning at the Caribbean Sea, three ranges run southwards and gradually gather into a mountain knot about the Equator. Their separating valleys are occupied by the river Magdalena and its tributary the Cauca. Through Ecuador there are two ranges, separated by a plateau. In the western range here Cotopaxi rises to a height of 19,000 feet, and in the eastern, Chimborazo reaches 20,000 feet. Within the Peruvian Mountains three ranges can again be traced. About 15° S. latitude these three for the second time converge, and within Bolivia we find once more two ranges and a plateau between. The Bolivian Plateau is, like the Great Basin, an area of inland drainage wherein Lake Titicaca is the counterpart of Great Salt Lake. In the bounding ranges of the plateau several peaks reach 21,000

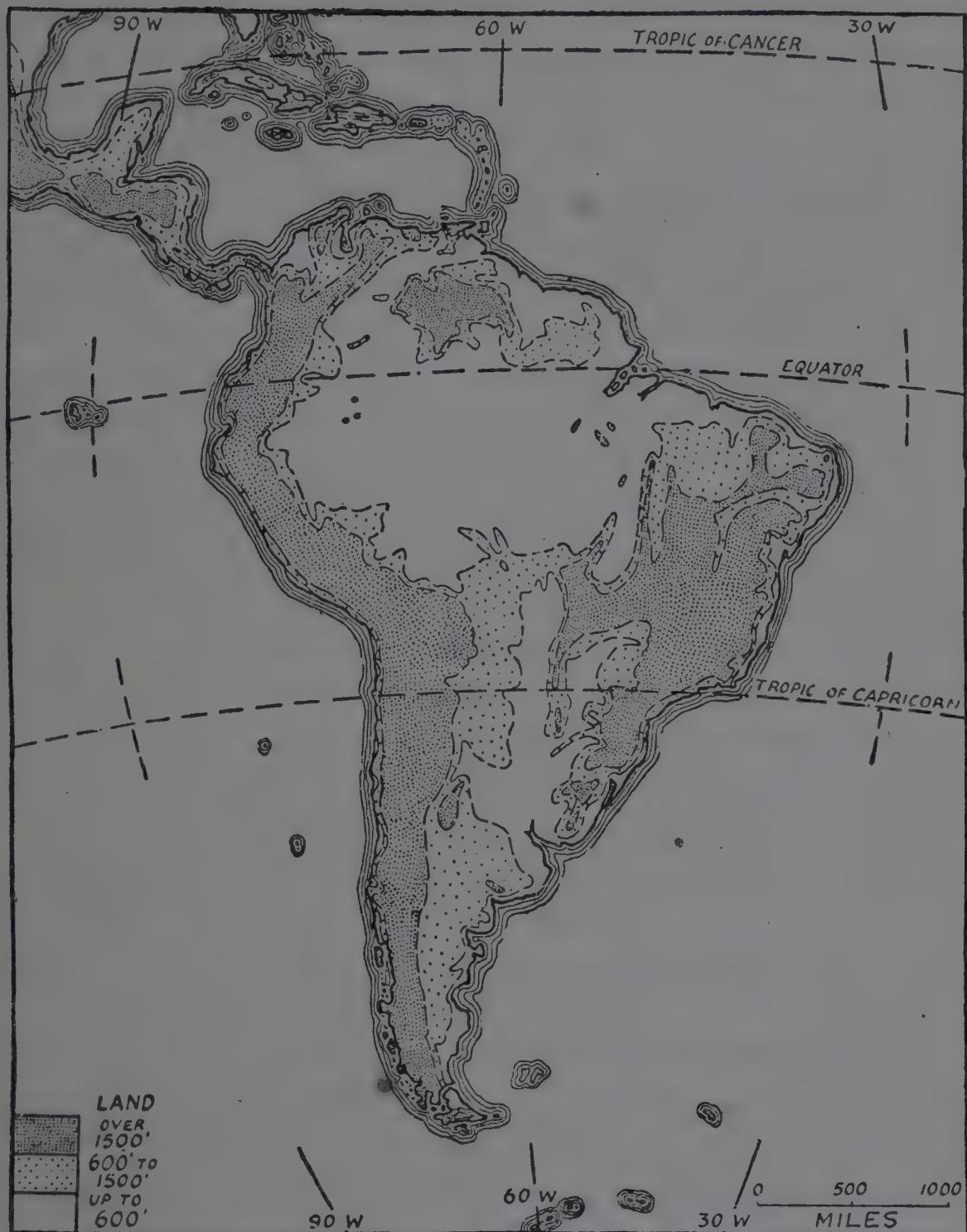


FIG. 31.—Generalised physical Map of South America.

feet. South of Bolivia the two ranges converge, this time into one mighty chain, the Andes proper. These extend to the very southern extremity of the continent. In the Andes, Aconcagua, the highest peak of the system, attains a height of close on 23,000 feet. Throughout Chile there is present a coastal range, like that of North America. In North Chile the central valley lies between this range and the Andes, just like the Californian Valley. In South Chile the coast resembles that of British Columbia, for the range runs through the islands and peninsulas, and straits take the place of a central valley.

(2) **Central Plains.**—The physical map will show you that, from the Western Mountains in South Colombia and from the plateau of Bolivia, two masses of highland stretch eastwards to link up with the Eastern Mountains. These two break the continuity of the Central Plains, so that, instead of one vast extent, we have three great separate sections occupied by the basins of the Orinoco, the Amazon, and the La Plata. These three get distinct names. In the north the basin of the Orinoco is known as the Llanos, in the centre the huge forested lowlands of the Amazon are called Selvas, in the south the extensive grasslands of the rivers which form the La Plata are termed Pampas.

(3) **Eastern Highlands.**—You will remember how, in North America, the St Lawrence broke up the Eastern Highlands into two sections. The Amazon does the same in South America. To the north of the mighty river lie the Guiana Highlands, a mass of uplands stretching west-east between the Upper Orinoco and the Atlantic Ocean. This mass is almost cut in two on the borders of British Guiana, for the Branco, a tributary of the Rio

Negro, comes very close to a tributary of the Essequibo. The western portion is sometimes called the Venezuelan Highlands and the eastern the Guiana Highlands proper. The best known height in the plateau reaches 8500 feet, but one mountain is said to be well over 10,000 feet. South of the Amazon are the Brazilian Highlands, bounded on the north by the plain of the Lower Amazon, on the north-west by the basin of the Madeira, on the south-west by the basin of the Paraguay-Parana, and on the east by the Atlantic. This great plateau may be divided into two sections. The first section, the West Brazilian Highlands, consists of a low tableland (the plateau of Matto Grosso) which separates the Upper Paraguay from the Amazon. The second section, the East Brazilian Highlands, includes all the uplands from Cape São Roque to the La Plata estuary, and is drained by three rivers—the Francisco, the Upper Parana, and the Uruguay.

3. Rivers.—Since the Western Mountains are close to the Pacific coast, the rivers draining to that ocean are short and of little importance. But within the sections of the Central Plain there are three great rivers—the Orinoco, the Amazon, and the La Plata. It is rather curious to note that of the three only the Amazon rises in the Western Mountains, but tributaries of the others come from those mountain ranges.

The Orinoco (1500 miles) takes its rise on the southward slopes of the Venezuelan Highlands and curves round them in a great bend ere it reaches the llanos proper. Just as in the case of the Congo, falls occur in the course of the Orinoco as it leaves the highlands at the rim of the basin. A tributary of the Upper Orinoco

actually joins the Rio Negro tributary of the Amazon. From the northern section of the Western Mountains the river receives several feeders. Across the llanos its course is generally eastwards. It enters the Atlantic by a great delta.

The Amazon Basin occupies half the Central Plain. Its area is the largest in the world. Indeed it could include the combined basins of the Mississippi, Nile, and Danube. Of the mighty river the Marañon is usually reckoned the head-stream. It rises in the Peruvian Mountains. After the confluence of the Ucayali the name Amazon is applied to the river. The total length from the source in the mountains across the vast selvas to the Atlantic is about 3500 miles. Of the left bank feeders the chief are the Napo, Putumayo, Japura and Rio Negro; of the right bank feeders the chief are the Ucayali, Jurua, Purus, Madeira, Tapajoz, and Xingu. The Amazon enters the ocean by an enormous estuary. In this lies the island of Marajo. We may regard the Para, to the south of this island, as a feeder of the estuary, to which it is indeed the main entrance. The Para is itself the estuary of the Tocantins, a river 1600 miles in length from the Brazilian Highlands. Ocean steamers can reach a point about 2000 miles up the Amazon, while smaller vessels can proceed for close on 500 miles farther inland. It is said that the enormous river system of the Amazon has something like 27,000 miles of navigable waterways. Eight of its tributaries are 1000 miles in length. The Madeira, the largest feeder, has a basin five times the area of the British Isles. It is claimed that the Amazon brings down a greater volume than any other river. Its freshwaters can be distinguished at least 200 miles out into the Atlantic.

The name La Plata Estuary is given to the combined mouths of the Parana and Uruguay Rivers. The Paraguay (1500 miles) rises in the Matto Grosso Plateau near the head-streams of the Tapajoz. Before joining the Parana it receives several tributaries from the Western Mountains. Of these the Pilcomayo is the chief. The Parana (2500 miles) rises in the East Brazilian Highlands and runs south-westwards to the confluence with the Paraguay. The course of the Parana is now southwards to the estuary. The Uruguay drains the extreme southern section of the Brazilian Plateau.

4. Climate.—Perhaps in no other continent do physical factors so closely affect climate. To show this, notice carefully three special points. The first point is that the main bulk of South America lies between the Equator and the Tropic of Capricorn. North of the former line, *i.e.* practically north of the estuary of the Amazon and the Gulf of Guayaquil, the continent narrows towards the Caribbean Sea; to the south of the Tropic the continent tapers to Cape Horn. Now what climatic conditions are likely to result from this? Clearly the portion of South America between the two lines will have a climate very like that of the Congo and lakes region of Africa. Here there will be but a slight difference between the summer and winter temperatures and the rainfall will be heavy. Later on, in the exercises, figures will be given to show how true this is. Again, since the continent tapers so much southwards, the difference in temperature between summer and winter will be less than in the great land-masses of similar latitudes in the Northern Hemisphere. The presence of the bounding oceans will of

course effect this. The second point we must mention is that the great line of the Andes runs very close to the west coast. Their influence will not be very much felt in the Equatorial region of heavy rains all the year round, nor at the Tropic of Capricorn where the dry areas on the world's surface are found. But farther south, on the belt of the westerly winds, the mountains will have a very heavy rainfall, and to the lee of these a rain-shadow will be found. The third point has also been already mentioned—the compactness of South America. Openings are few, so that the influence of the oceans does not get far inland. Only in the extreme south, just where the continent is narrow, do we find a somewhat indented coast.

(1) **Temperature.**—Look now at the isotherms map. (Remember that, as we are in the Southern Hemisphere, January is "summer" and July is "winter".) Note how closely parallel the isotherms for July are. The northern portion of the continent (Colombia, Venezuela, and Guiana) has a temperature of over 80° F. In the south, Patagonia and Southern Chile have under 50° F. You will see that the isotherms bend slightly southwards over the land. We noted the same fact in the case of North America. The reason is the same for both continents—the interior during the winter months is somewhat cooler than the coasts. In the case of the January isotherms one striking thing is the large area over 80° F. Still more striking is the fact that, with the exception of Chile and Patagonia, the whole of South America has for this month a mean temperature of over 70° F.

(2) **Rainfall.**—The map showing the distribution of rainfall is probably more important than the temperature map. In the Equatorial belt, and in the Southern Andes

SOUTH AMERICA

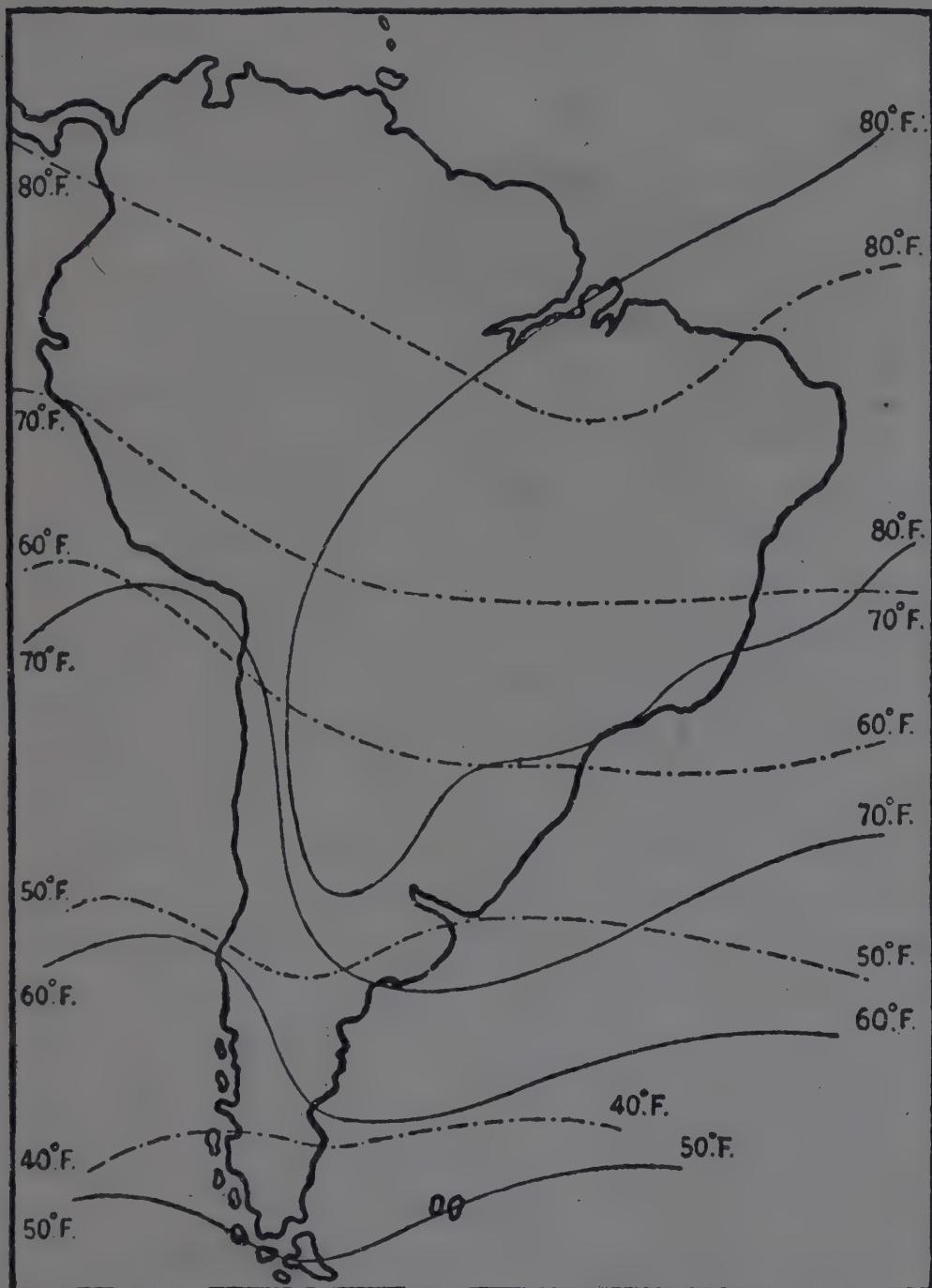


FIG. 32.

where the effect of the westerlies is felt, the rainfall is over 75 inches. Practically the whole of the Amazon Basin has a

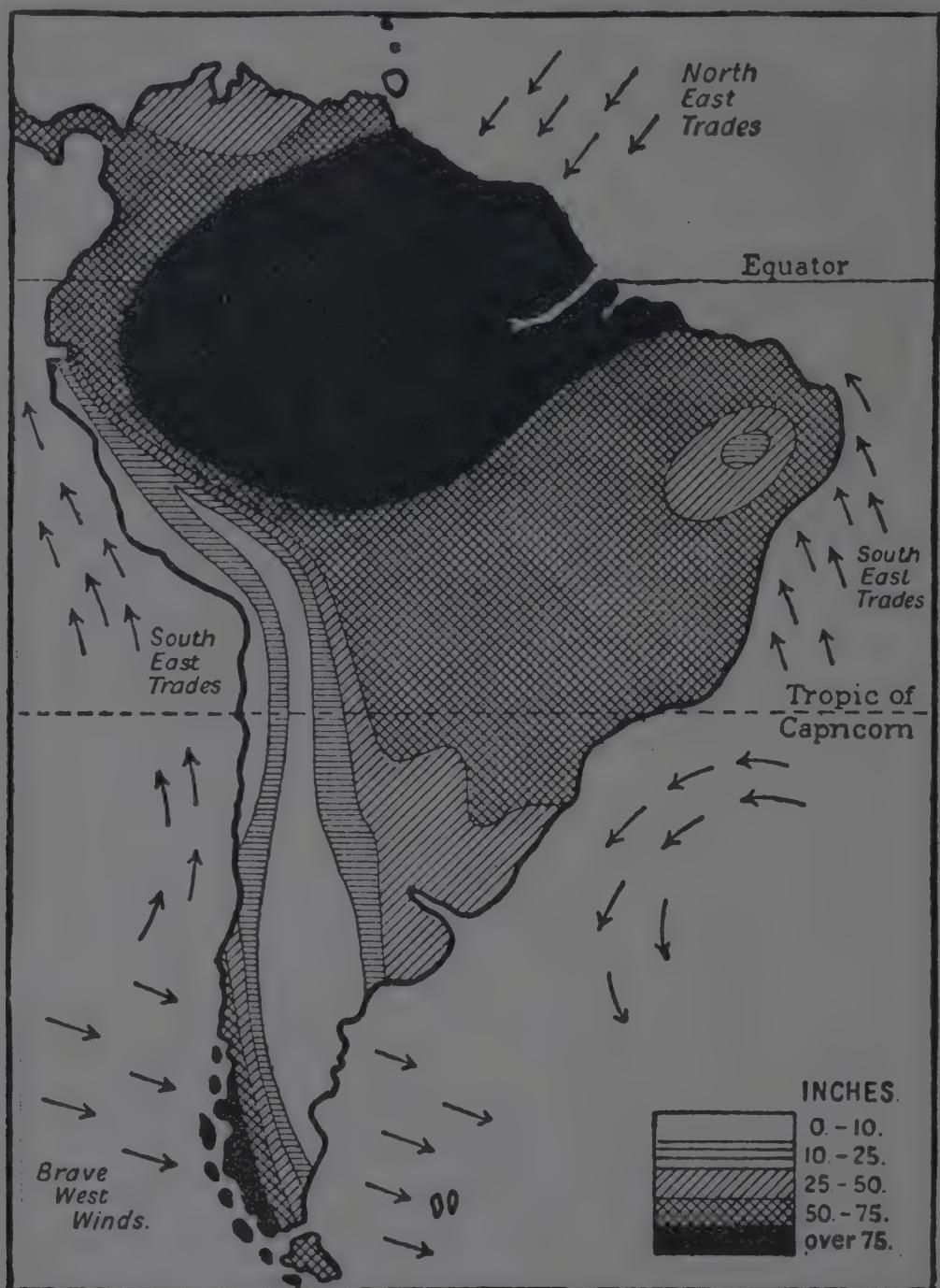


FIG. 33.—South America. Winds and rains during the year.

very heavy rainfall. With the exception of the west coastal strip, the Lake Titicaca Basin, and a portion of the East Brazilian Highlands, the whole of the continent north of the

Tropic of Capricorn has an annual rainfall of over 50 inches. On the Tropic we find the Desert of Atacama. It belongs

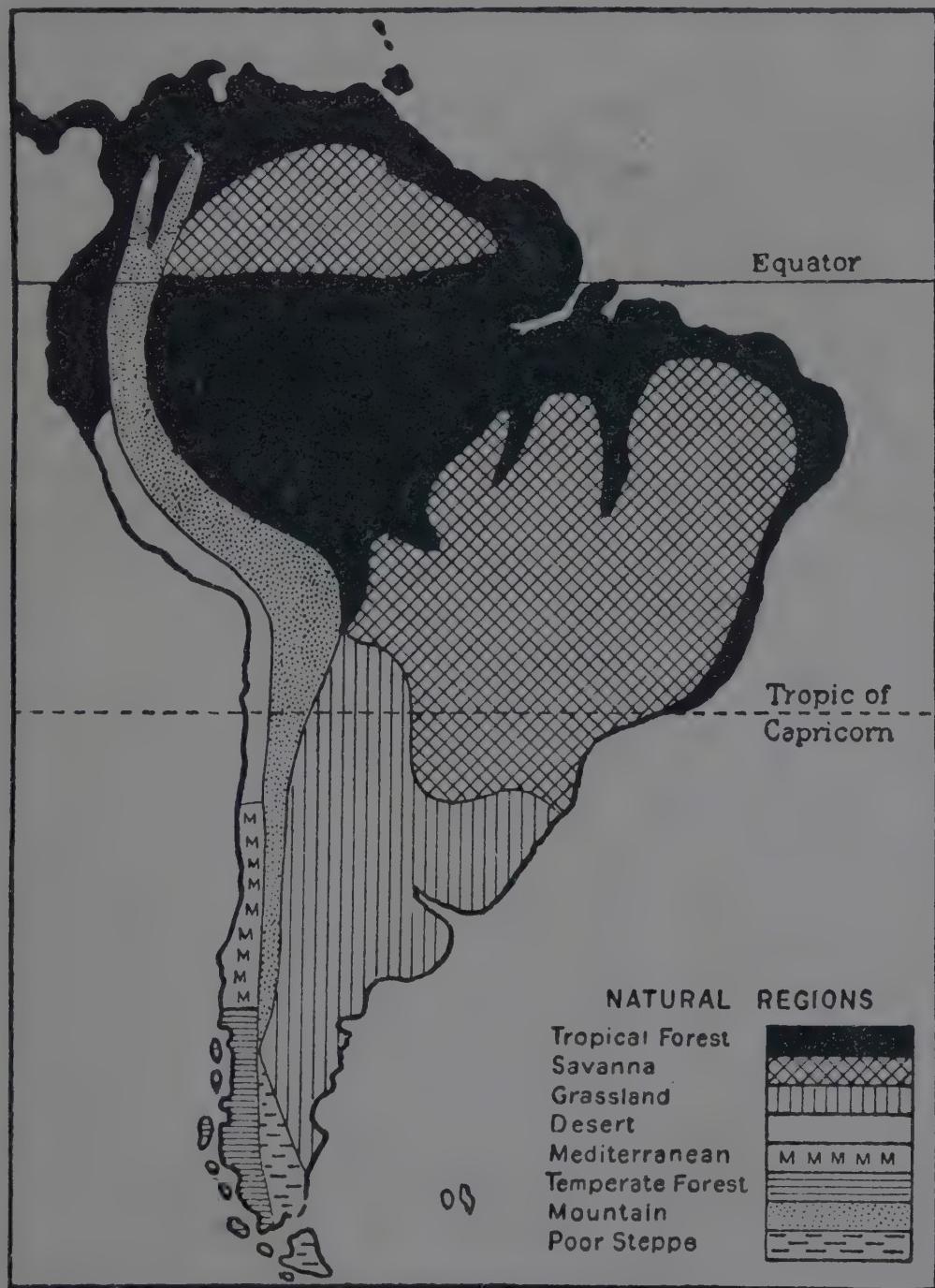


FIG. 34.—South America. Natural regions.

to the Southern Hemisphere girdle of deserts—Atacama, Kalahari, and the so-called Great Victoria. Notice the very pronounced rain-shadow in Southern Argentina.

5. Natural Vegetation Regions.—The map showing these brings out clearly the fact we have so often emphasised—the close connection between rainfall and vegetation. Since the regions are much the same in general character as those we have already described, we need merely mention them in the case of South America. Where the very heavy Equatorial rainfall occurs, there is the tropical forest, covering most of the Amazon Basin and the coast areas of Colombia, Venezuela, and Guiana. In the Brazilian Plateau, in the Guiana Highlands, and in most of the basin of the Orinoco, where the rainfall is slightly less heavy, the dense forest gives way to savanna. Argentina, under the lee of the Andes, is the great grass-land of South America. The name pampas is given to the prairies of the Parana-Paraguay Basin. The South American Equatorial forests are called *selvas* and the savannas of the Orinoco are termed *llanos*. We have already mentioned the Desert of Atacama. Note on the map the long western strip of very little rainfall. Middle Chile is the California of South America—it possesses the typical Mediterranean vegetation. Southern Chile resembles Western Europe or British Columbia. Here are found the forests of temperate latitudes. The long line of the Andes, like the Rockies and the mid-old world fold system, has its special mountain vegetation. South Patagonia is a treeless waste where vegetation is stunted.



CHAPTER XIX

SOUTH AMERICA: INDUSTRY AND COMMERCE

6. Products and Occupations.—We do not expect to find in South America busy industrial centres like those of the northern part of the New World. There are here no towns comparable with Pittsburgh, Chicago, Minneapolis, or Philadelphia, no vast wheat and maize belts with their extraordinary network of railways, no huge coalfields or iron mines. South America is as yet an undeveloped continent, but it has great possibilities ahead.

Let us take agriculture first. Within the pampas or grasslands of Argentina millions of sheep, cattle, and pigs are reared. Most of the well-known companies which specialise in meat extracts have their huge ranches on the plains. Chilled beef, mutton, and pork are exported in large quantities. Buenos Aires, the capital of the Republic and the biggest town in the Southern Hemisphere, is the Chicago of South America, with a great slaughtering, freezing, and canning industry. The ranching area extends into Uruguay and South Brazil. Of the former about 60 per cent. of the total area is devoted to stock-raising. Fray Bentos and Paysandu, the chief centres of the meat industry in Uruguay, are world famed. Monte Video is the state's main outlet for the ranching products. Cattle rearing is developing in the llanos of the Orinoco Basin. Just as in the prairies of North America, we find in the pampas extensive grainlands, especially of wheat,

maize, and oats. Rosario, Santa Fé, and Bahia Blanca are the grain ports. In Argentina alone there are 17 million acres under wheat cultivation.

Argentina is a progressive state and is rapidly extending its fruit-growing. Grapes do very well here. In 1923 the Republic produced 12 million gallons of wine. Mendoza is the chief centre. Central Chile, the Mediterranean region of South America, grows all the typical fruits. Here also wine-making is developing.

Of the Amazon Basin by far the most important product is rubber. The main centres are Para at the estuary and Manaos in the interior. For rubber Bolivia comes next after Brazil. From the latter country is obtained four-fifths of the world's supply of coffee. The chief area lies round São Paulo, in South-eastern Brazil, just on the Tropic of Capricorn. Coffee is the staple product of Colombia. Along the east coast of Brazil cocoa is extensively grown. Ecuador is also noted for its cocoa. The chief sugar areas are in Peru and the Guianas. Tobacco flourishes in Brazil.

As in British Columbia, South Chile has rich supplies of useful timber, and lumbering is here a growing industry.

Many of the South American states possess abundant mineral wealth. The Brazilian Plateau is said to be rich in coal, gold, and precious stones. As yet the sources are almost untouched. The chief area here is the Minas Geraes province. In the three northern states—Colombia, Venezuela, and the Guianas—there are evidences of widely extended petroleum fields. At present the chief oil area lies round Lake Maracaibo. The oil industry looks like assuming large proportions in the near future. The dry region of South Peru and North Chile has most

valuable deposits of nitrate of soda. Iquique is the chief port. The mountains of North Chile supply silver and copper. Indeed this state is the world's second largest producer of the latter metal. The ores are exported from Antofagasta. Within the Bolivian Plateau there is considerable mineral wealth, especially of silver, copper, and tin. The state produces one quarter of the world's total tin output. Further it is the chief source for bismuth. Oruro and Potosi are the main mining centres.

Some idea of the principal occupations of South America may also be gathered from the list of exports to Britain. The figures are in million pounds sterling.

Wheat (Argentina)	11
Maize	8
Mutton	6
Chilled Meat ,,. . . .	5
Cotton (Peru)	5
Chilled Meat (Uruguay)	4
Tin Ore (Bolivia)	3½
Wool (Argentina)	2
Coffee (Brazil)	2
Sugar (Peru)	2
Nitrates (Chile)	9/10
Wool (Chile)	9/10
Copper (Chile)	8/10

The five largest towns of the continent are as follows:—

Buenos Aires	Pop. 1,800,000
Rio de Janeiro	1,160,000
São Paulo	580,000
Santiago (Chile)	500,000
Monte Video	400,000

EXERCISES

1. Using the scale on the map in your atlas, measure the greatest breadth and greatest length of the continent.
2. Name one strait of importance, three islands, and five openings.
3. Make a sketch map of South America between the lines of 20° and 40° south latitude.
4. South America is noted for the low temperature ranges. Here are a few; put them into diagram form.

Quito, 7° F.; Bogotá, 16° F.; Para, 27° F.; Rio de Janeiro, 10.6° F.; Lima, 12.8° F.; Santiago, 20.8° F.; Buenos Aires, 23.4° F.; Bahia Blanca, 25.2° .

5. Below we give the yearly rainfall in inches of a number of places: (1) belongs to the region of very heavy Equatorial rains; (2) to the region of westerly winds; (3) to the north of the continent outside the Equatorial zone; (4) to the Argentina rain-shadow; (5) to the Tropic of Capricorn region of very little rainfall.
 (1) Cayenne=118"; (2) Valdivia=105"; (3) Pernambuco=79"; (4) Santa Cruz=6"; (5) Iquique =.05". Make a diagram to show these.
6. Copy and colour the vegetation map.
7. Take the ten chief exports to Britain as shown in the list and make a diagram to represent their comparative values.

CHAPTER XX

THE OCEANS

The total area of the surface of the globe is 197 million square miles. Of these, land occupies about 55 million and water 142 million. To put this otherwise we might say that water covers 72 per cent. of the total world surface and land occupies 28 per cent. And still further it might be added that the water surface is roughly two and a half times the land surface.

The continents then may be regarded as great island blocks. Of these the two mightiest are the areas which we call the Old World (Europe, Asia, and Africa) and the New World (North and South America).

Since the water covering of the globe is continuous, the divisions which we usually term oceans are not clearly marked off. In geography we recognise five such divisions—Atlantic, Pacific, Indian, Arctic, and Antarctic. Now the Arctic Ocean is the meeting place northwards of the waters of the Atlantic and Pacific Oceans; for there is a wide channel between North-west Europe and North-east America, and the narrow Bering Strait links the Pacific and the Arctic Oceans. The Arctic Ocean surrounds the North Pole and is girdled by the shores of Eurasia and North America. The Antarctic Ocean differs from the Arctic in that it is not a great basin surrounded by land but a great zone of waters surrounding the frozen

lands at the South Pole. Hence its limits northwards are difficult to define. We know that the Arctic Ocean ends at the coasts of the encircling lands, but there can be no such definite decided boundaries in the case of the Antarctic. It is usual to regard the line of latitude 60° S. as the map boundary. Hence a line from Cape Horn due south to the 60° line would act as the boundary between the Pacific and Atlantic Oceans, a line from Cape Agulhas would form the boundary between the Atlantic and Indian Oceans, and a line from South Cape (Tasmania) would be recognised as the boundary between the Indian and Pacific Oceans. But some writers give the name Southern Ocean to the vast sweep of waters girdling the globe between 40° and 60° S. latitude. In actual fact both the Antarctic Ocean and the Southern Ocean are just continuations southwards of the three main oceans.

The Pacific, the largest of the oceans, has a surface area greater than the total land surface of the globe. On one side of it stretches the full extent of the New World, a clearly marked frontier. On the other side note the great number of islands along the eastern shore of Asia and in Australasia. This ocean is roughly triangular in shape, narrowing towards the north and broadening considerably southwards.

We have already mentioned that, in the case of the Atlantic Ocean, its opposite shores seem to fit, just as though the Old and New Worlds had once been joined. It lacks the many islands and island groups so thickly strewn over the Pacific.

Like the Pacific, the Indian Ocean is also roughly triangular. It is bounded on the west by the shores of Africa, on the east by the Malay Peninsula and

Archipelago and by Australia; its northern boundary is Asia.

It must not be supposed that the oceans have all a uniform depth. Apart from the islands, there are four formations—ridges, rises, deeps, and shelves. The ridges are long, narrow heights rising from the ocean bed, but not necessarily reaching the surface. Perhaps the best known ridge is that which stretches throughout the entire length of the Atlantic midway between its opposite shores. In the North Atlantic the ridge is known as the Dolphin Divide. The Azores Islands are a part of this divide which rises above the surface. In the South Atlantic the Challenger Divide has a similar height known as Ascension Island. Rises are broader swellings on the ocean bed. Just as the ridges may be regarded as lines of hills so the rises may be regarded as plateaux. One great rise connects Scandinavia and Greenland. Another, in the Pacific, runs south-west from Central America. A third, in the Indian Ocean, stretches from India to Madagascar. Deeps are parts of the ocean bed which fall very much below the general depth. Several deeps skirt the Divides of the Atlantic. In the North Pacific the Great Tuscarora Deep, which skirts the Japan Islands, is the deepest known place in the world. Shelves, or continental shelves, are parts of the ocean bed skirting the shores of some portions of the continents. They are really submarine extensions of the continents. On the west of Europe the British Isles stand on a great continental shelf over which the North Sea, the English Channel, and the Irish Sea are shallow waters.

EXERCISES

1. Find what island groups are cut by the Equator.
2. Compare the Western Pacific with the Eastern Pacific; which has the greater number of islands?
3. Name the chief groups of islands which could be crossed in a voyage from Auckland, N.Z., to Victoria, B.C.
4. Name at least four lengthy island chains.
5. Look for five peninsulas in the world which have accompanying islands. Name both peninsulas and islands.
6. Can you suggest why the following islands got their names? —Easter Island, Christmas Island, West Indies, Newfoundland, Greenland, Iceland, New Caledonia, Cook Island.
7. State whose names have been associated with these three islands: St Helena, Samoa, Iona.
8. The figures attached to the names represent areas in thousands of square miles. Make a comparative diagram.
Borneo, 280; Madagascar, 228; Great Britain, 89;
Honshiu (Japan), 87; South Island (New Zealand),
58; Newfoundland, 40; Tasmania, 26; Ceylon, 25.

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